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Hirashima et al.

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(54) **TELEVISION RECEIVER AND ELECTRONIC DEVICE**

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(71) Applicant: **Kabushiki Kaisha Toshiba**, Tokyo (JP)
(72) Inventors: **Masaya Hirashima**, Tokyo (JP);
Tsuyoshi Kozai, Tokyo (JP)

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(73) Assignee: **Kabushiki Kaisha Toshiba**, Tokyo (JP)

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Primary Examiner — Thai Tran

Assistant Examiner — Mishawn Hunter

(74) *Attorney, Agent, or Firm* — Knobbe, Martens, Olson & Bear LLP

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(57) **ABSTRACT**

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H01R 12/70 (2011.01)
H01R 12/72 (2011.01)
H01R 27/02 (2006.01)

(52) **U.S. Cl.**

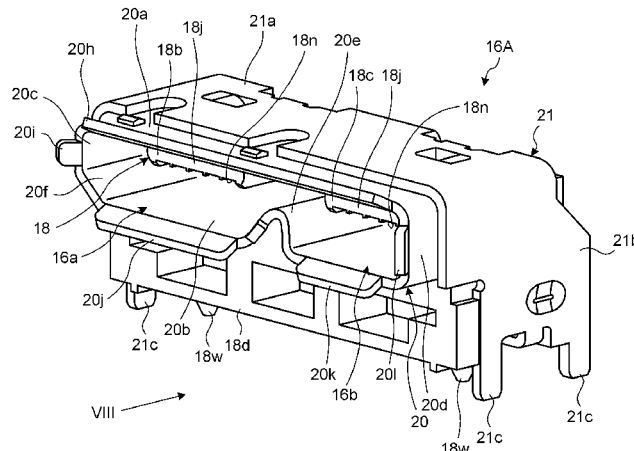
CPC **H04N 5/64** (2013.01); **H01R 12/7076**
(2013.01); **H01R 12/724** (2013.01); **H01R**
27/02 (2013.01)

(58) **Field of Classification Search**

CPC H04N 5/64; H04N 5/655; G06F 1/16
USPC 348/836
See application file for complete search history.

According to one embodiment, a television receiver includes: housing; display; circuit board; and connector. The connector is electrically connected to the circuit board, and connected with an external connector. The connector includes: an insulating member; terminal members; and a container. The insulating member includes: a base portion; and an insertion portion extending from the base portion toward the second opening and inserted into a connection portion of the external connector. The terminal members are provided to the insertion portion, and coupled to the connection portion. The container is configured to house the insertion portion. The insertion portion includes: a side surface; and a slanted surface provided to at least one of ends of the side surface at the base portion side and the other one of the ends of the side surface. The slanted surface is slanted with respect to the side surface.

14 Claims, 24 Drawing Sheets



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FIG.1

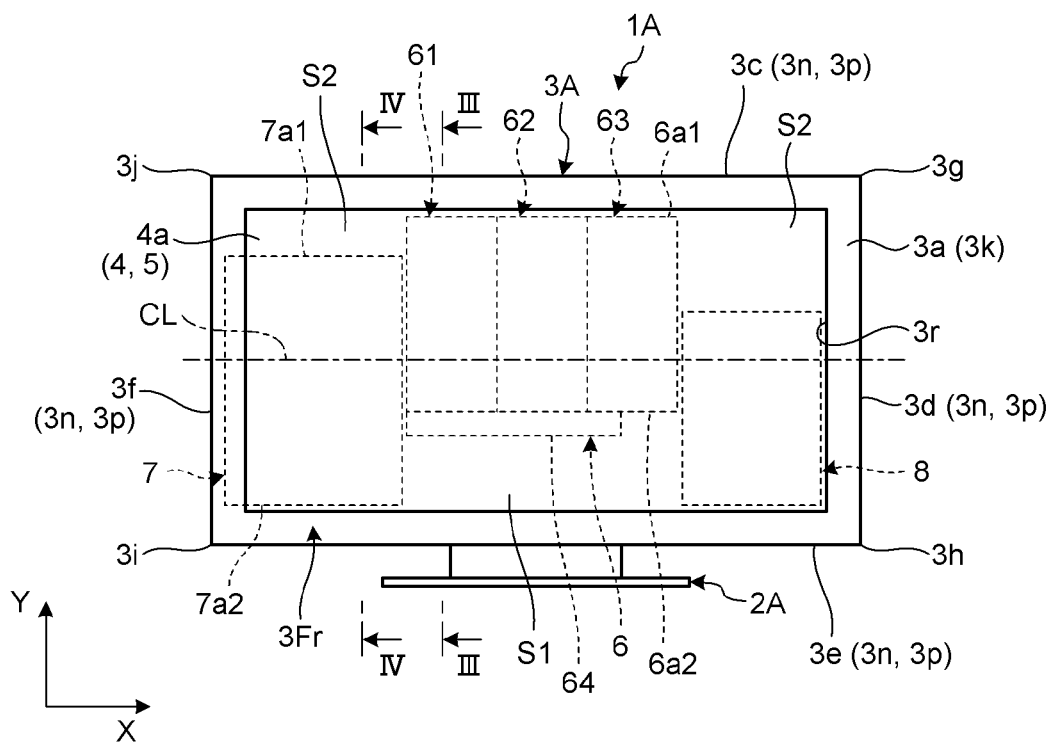


FIG.2

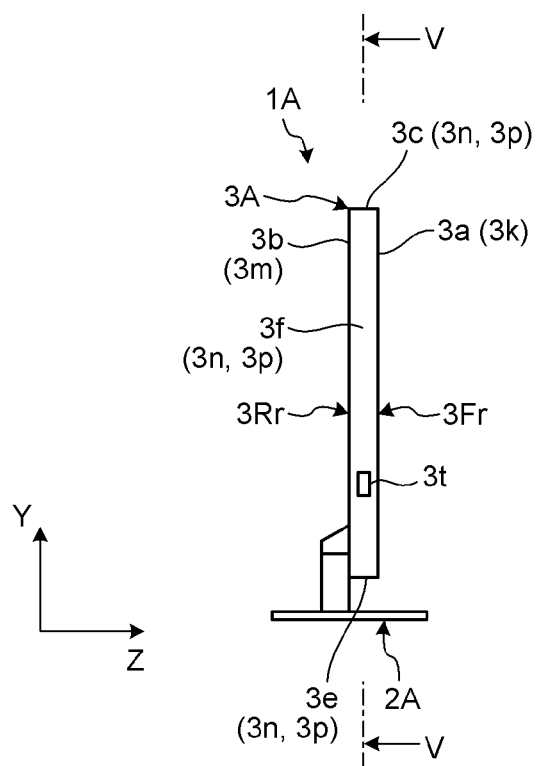


FIG.3

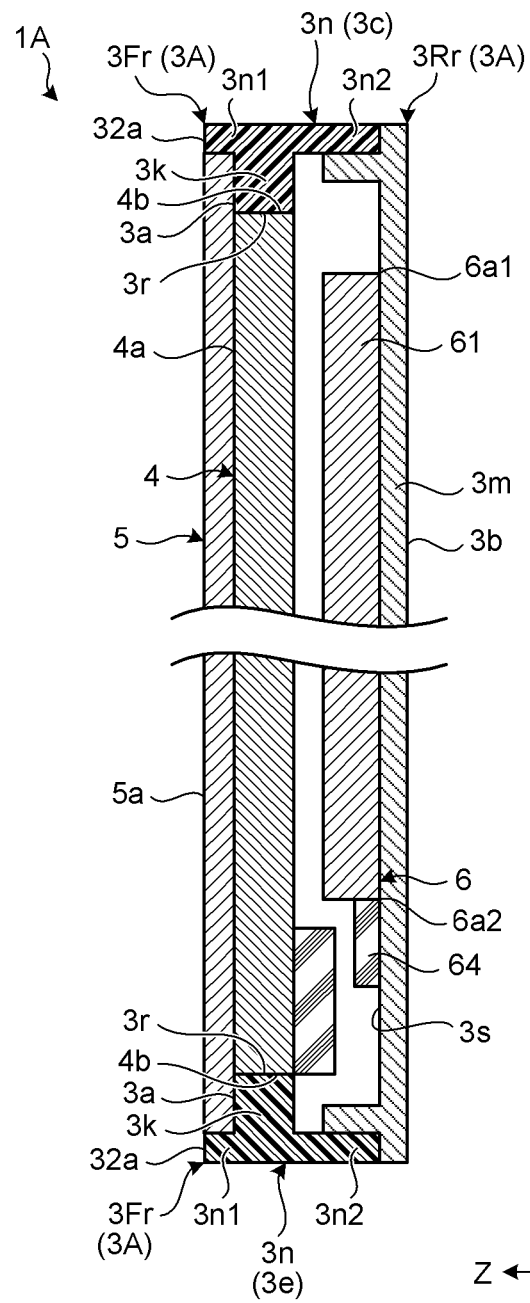


FIG. 4

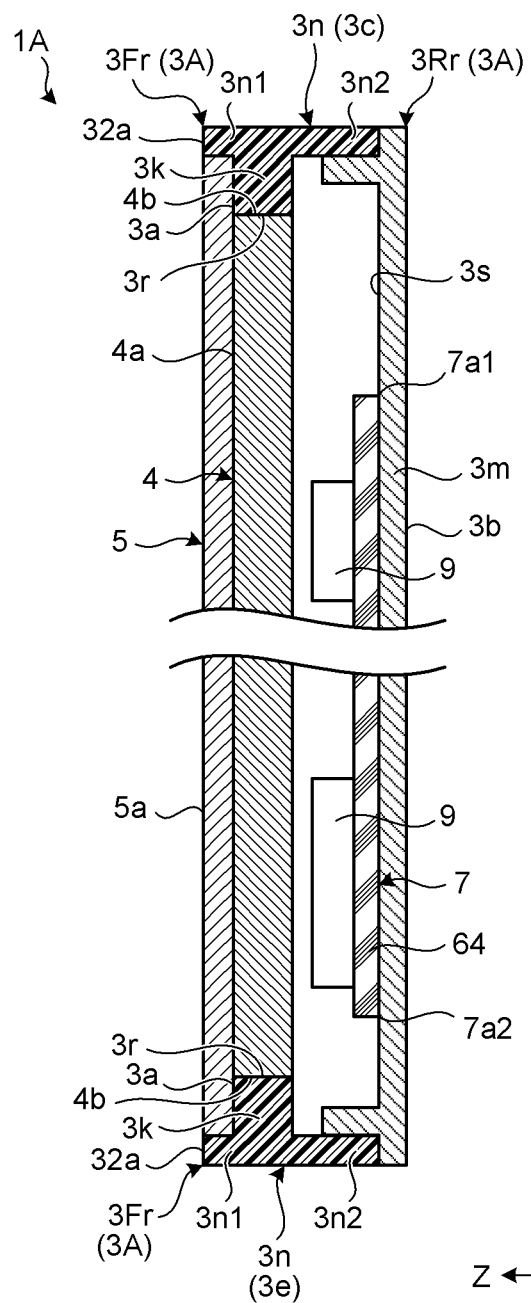


FIG.6

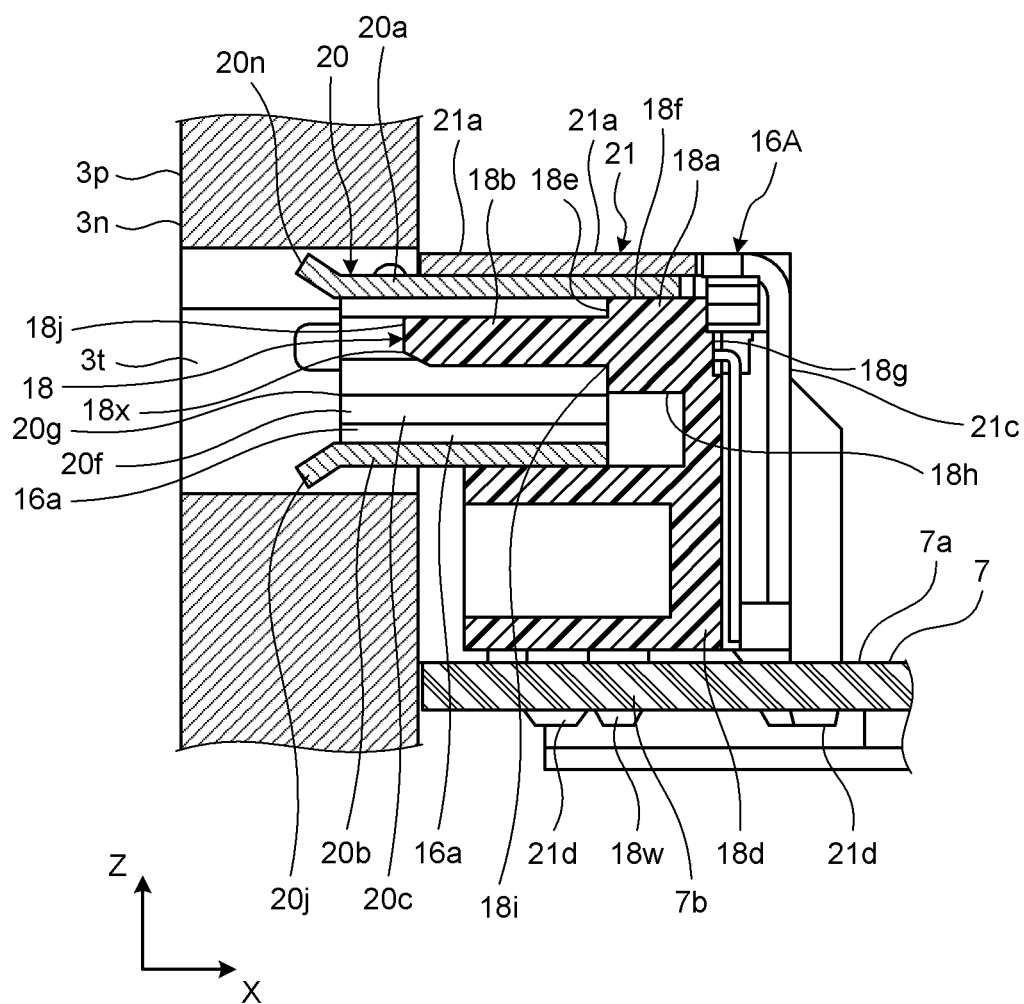


FIG.7

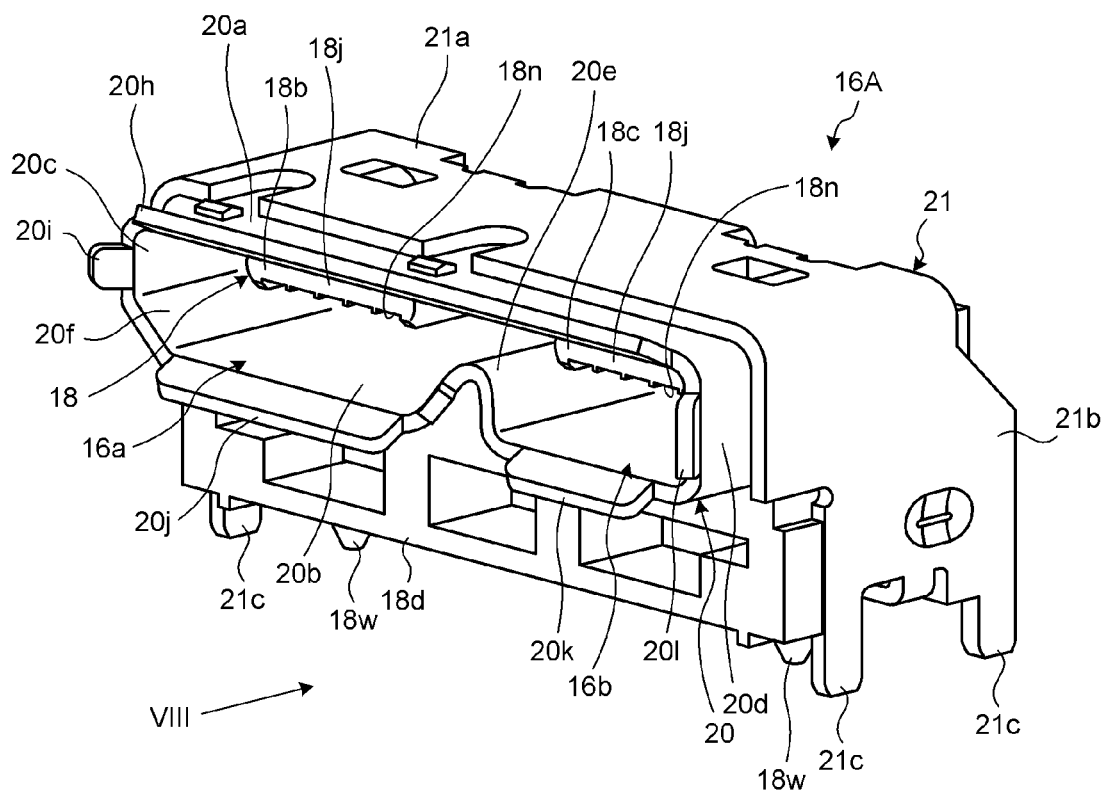


FIG.8

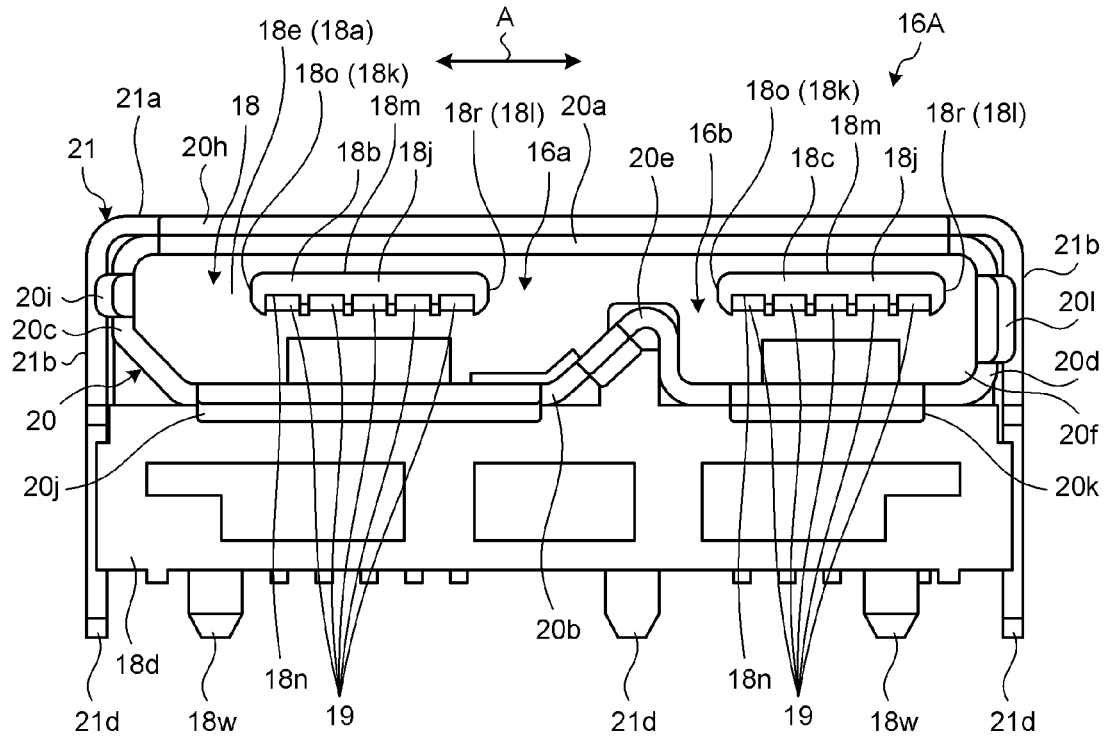


FIG.9

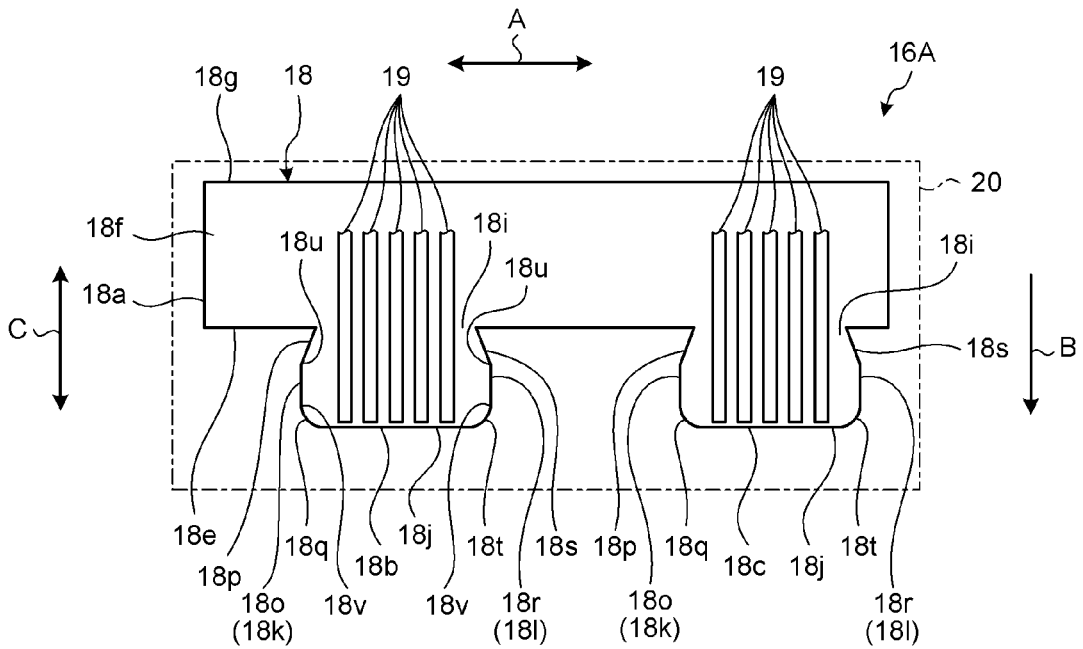


FIG.10

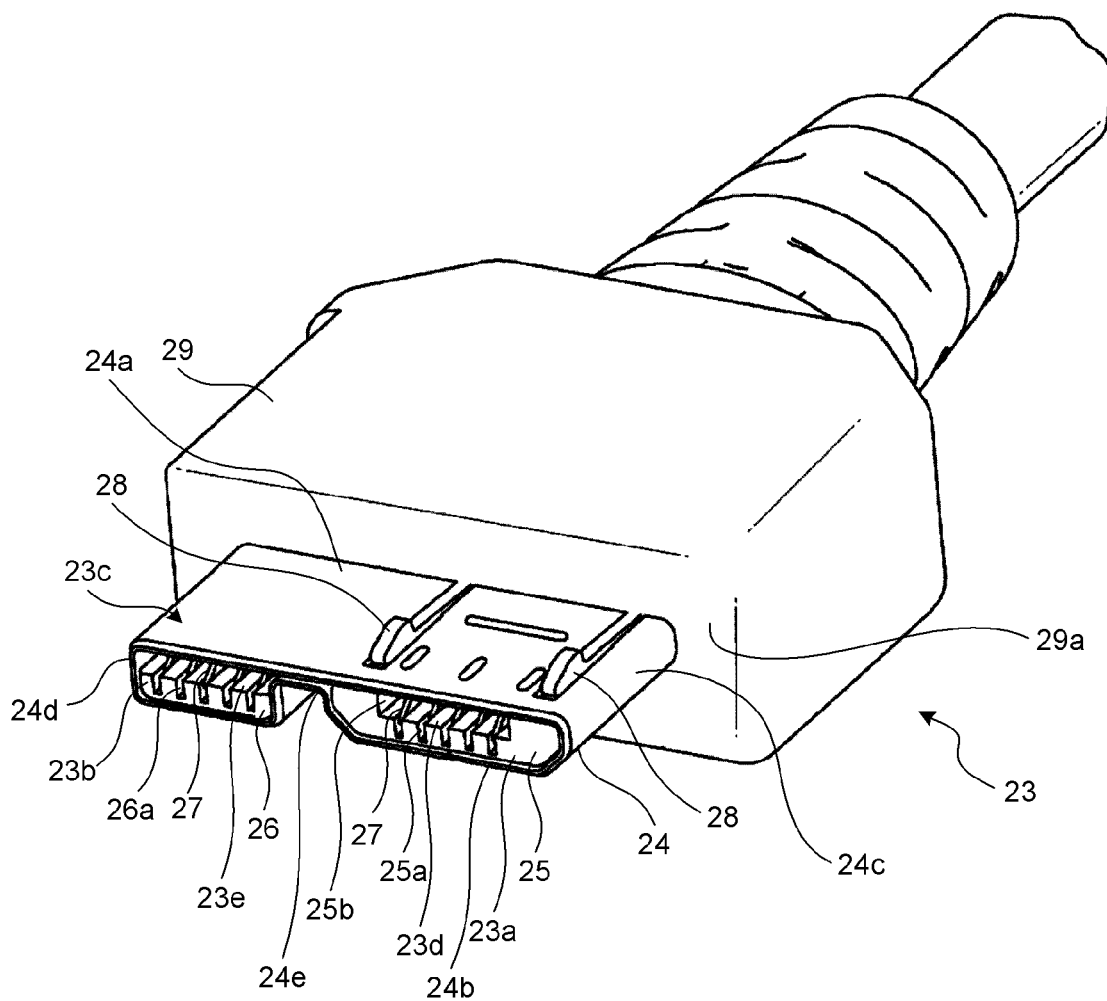


FIG. 11

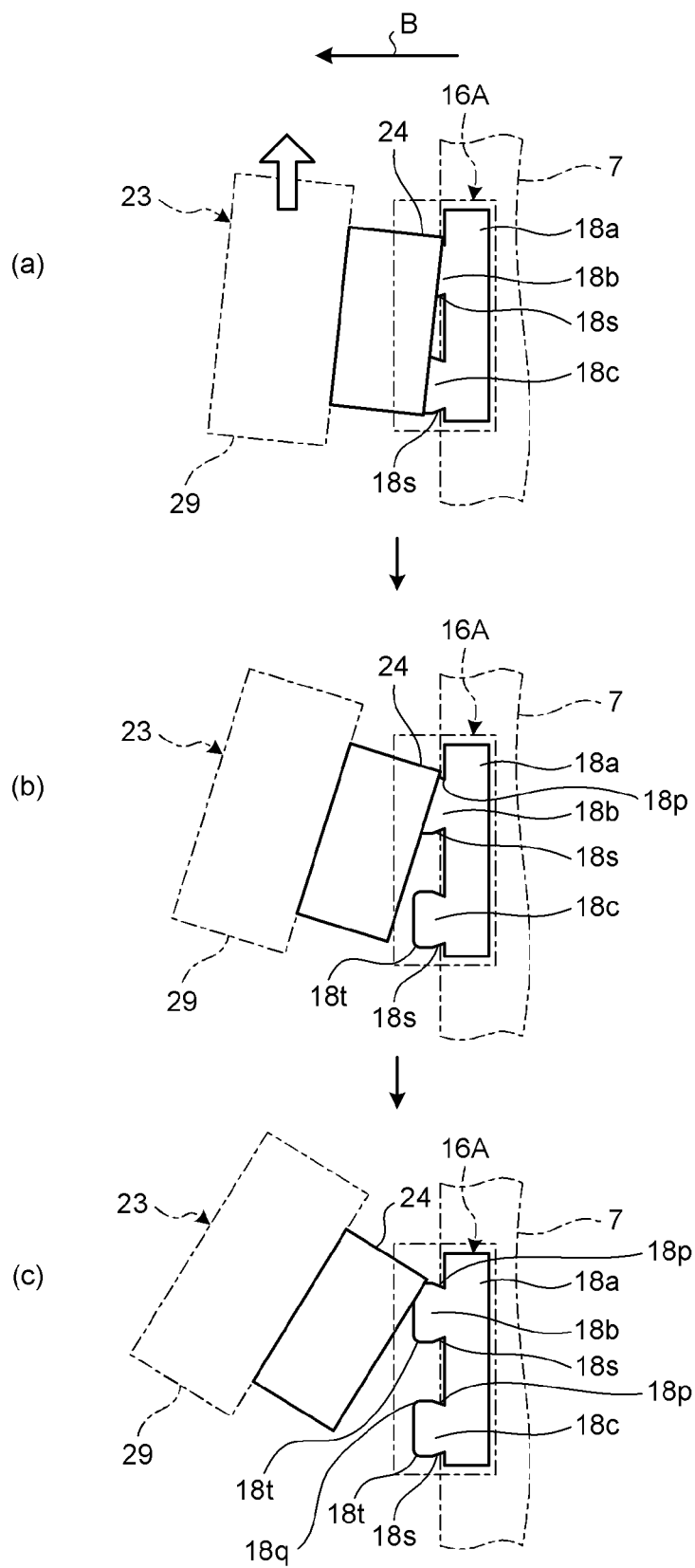


FIG.12

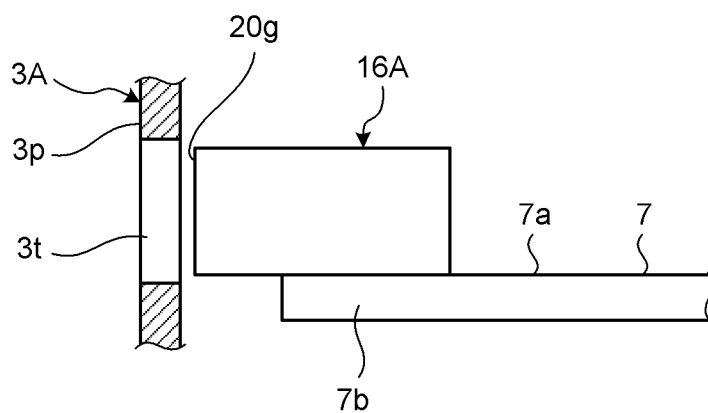


FIG.13

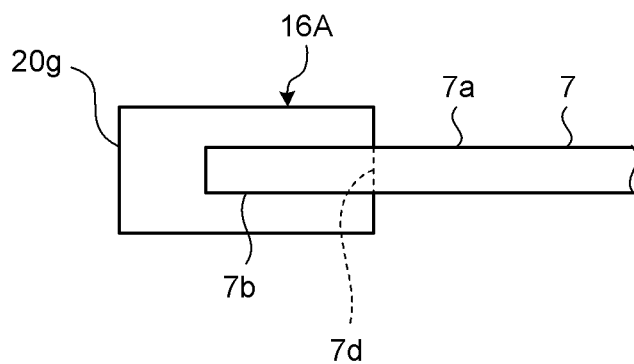


FIG. 14

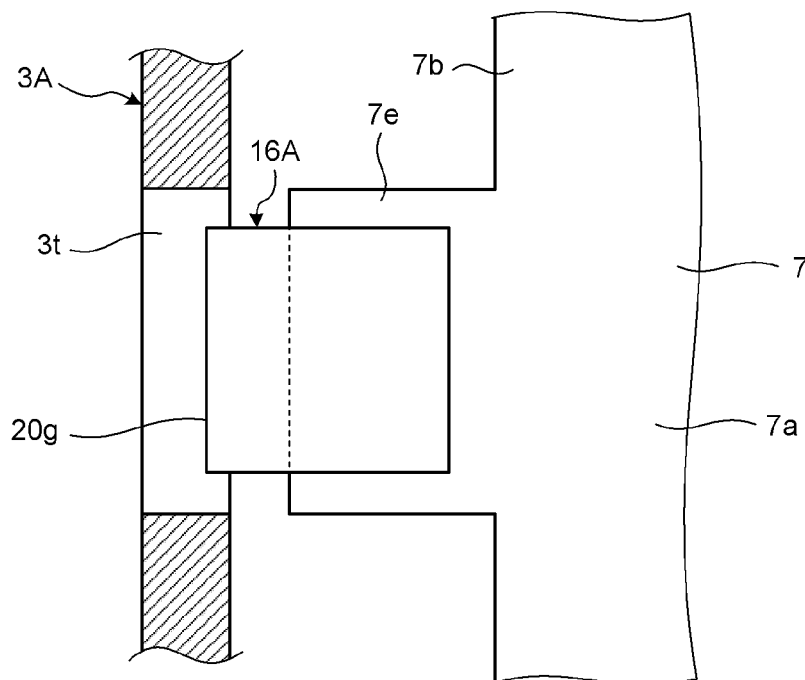
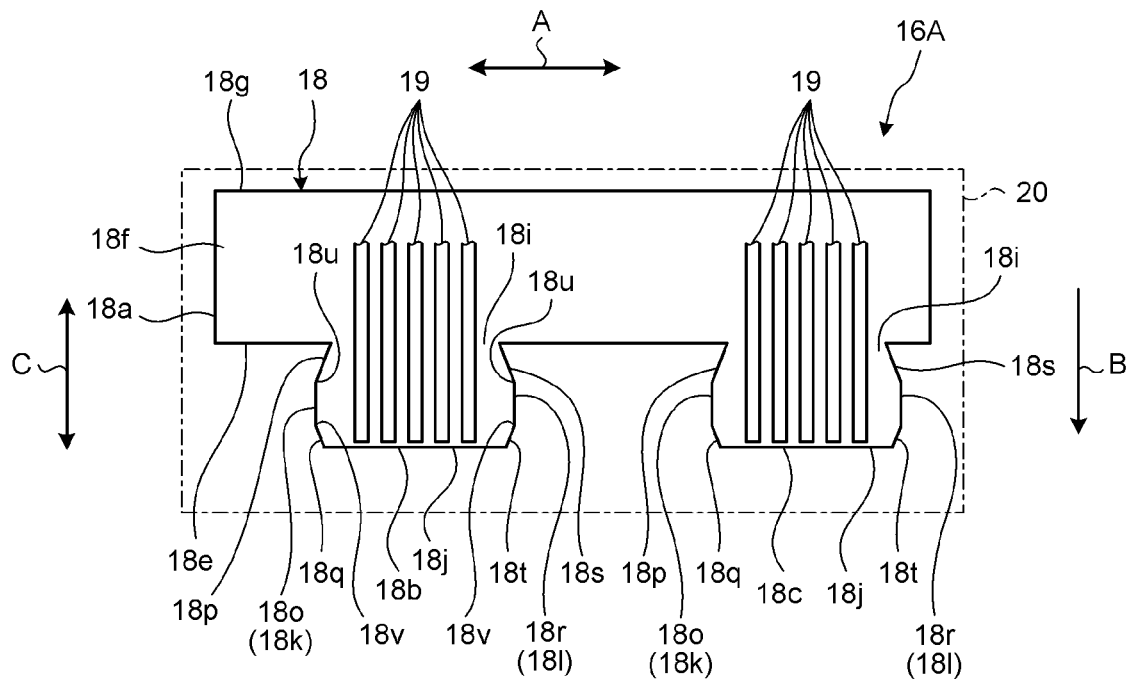


FIG. 15



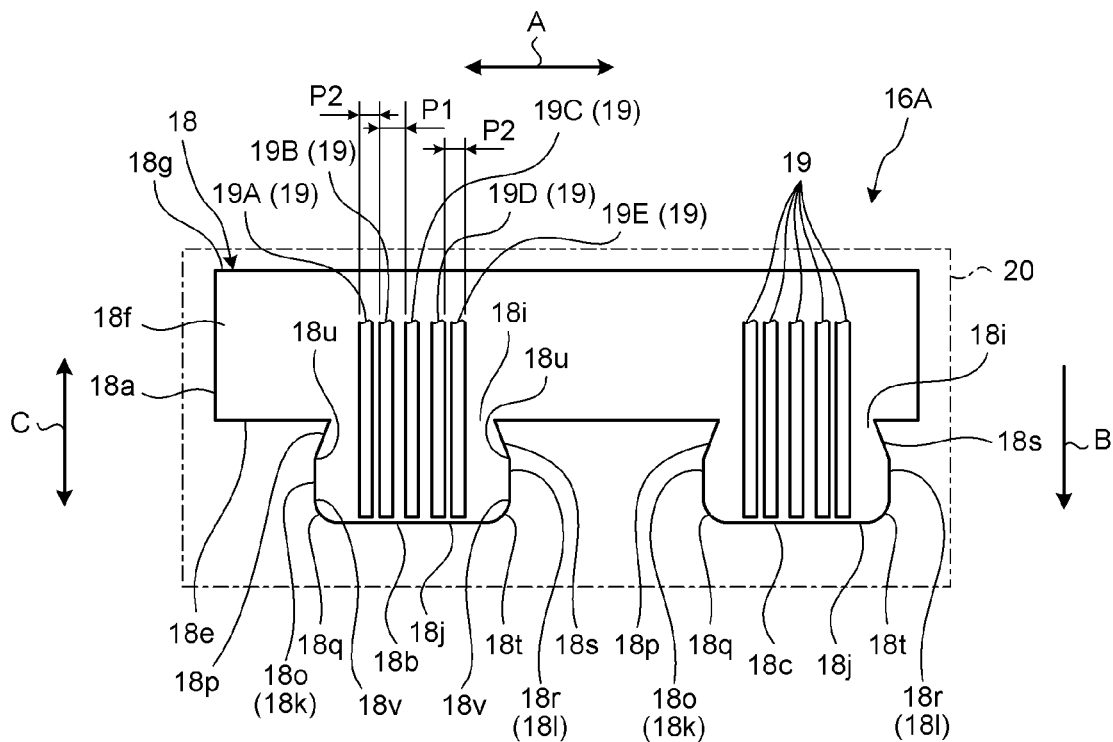


FIG. 18

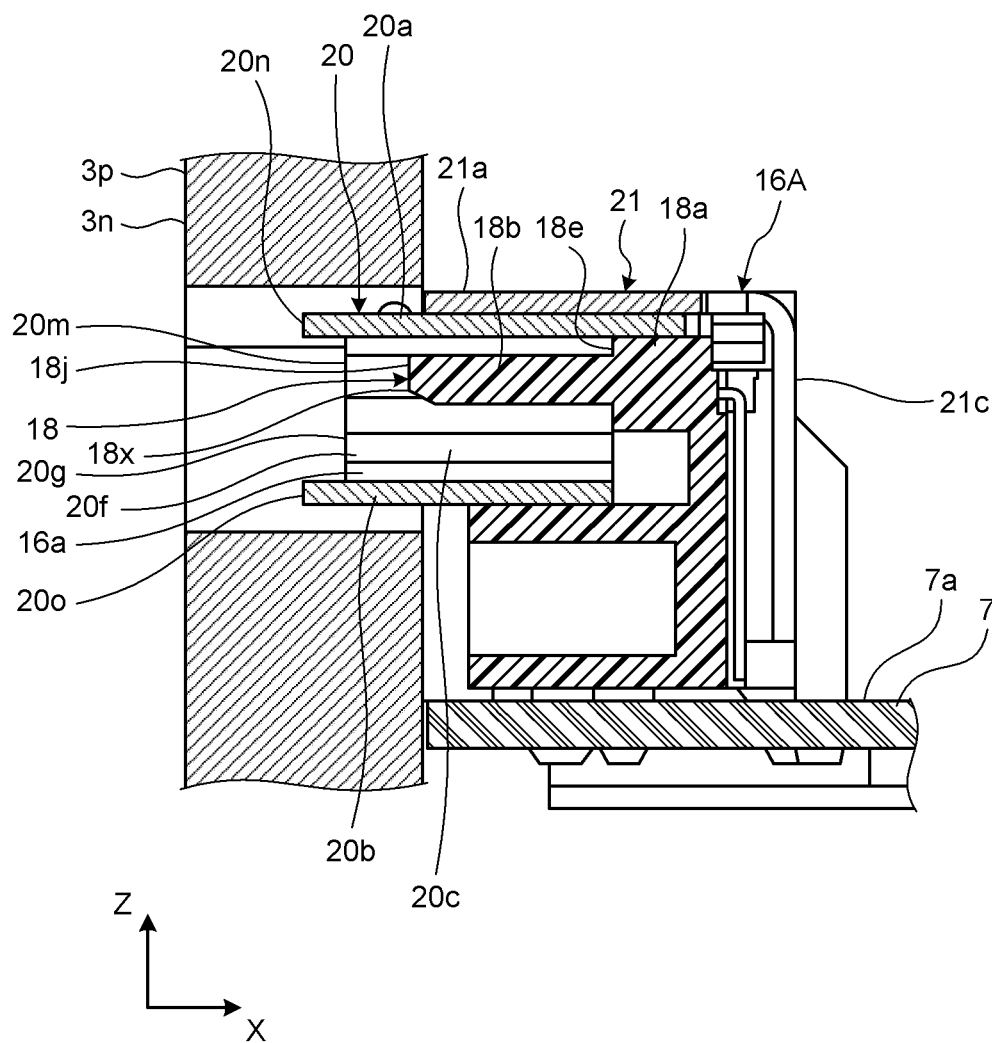


FIG. 19

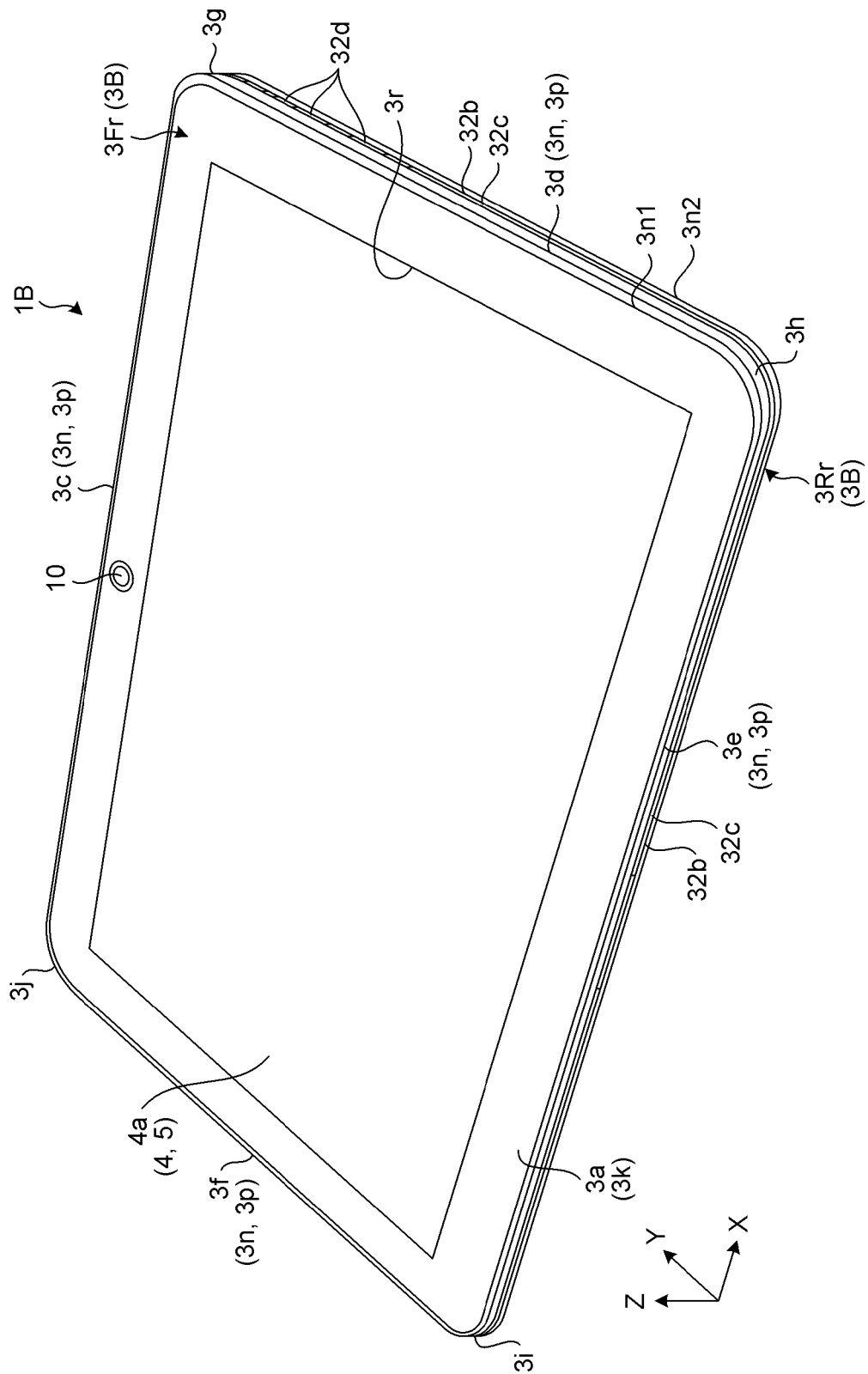


FIG.20

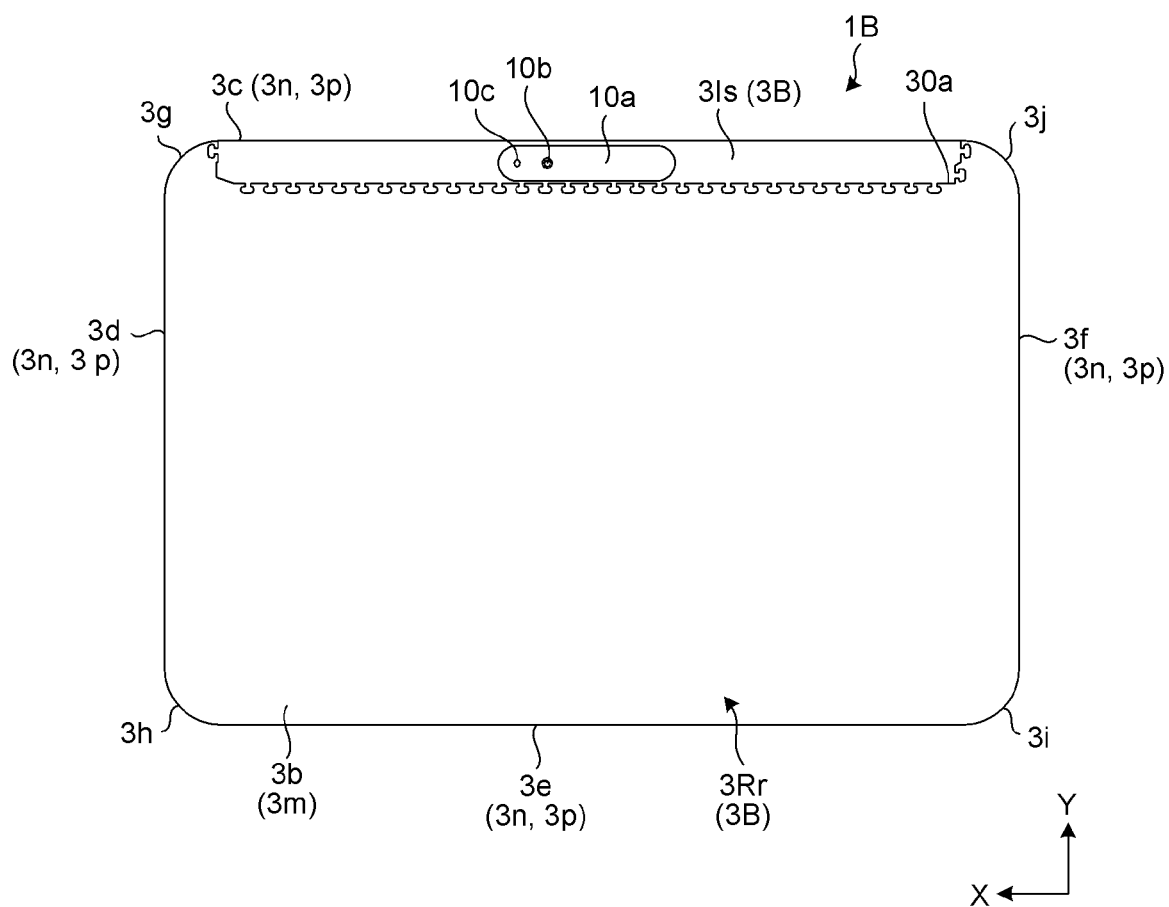


FIG. 22

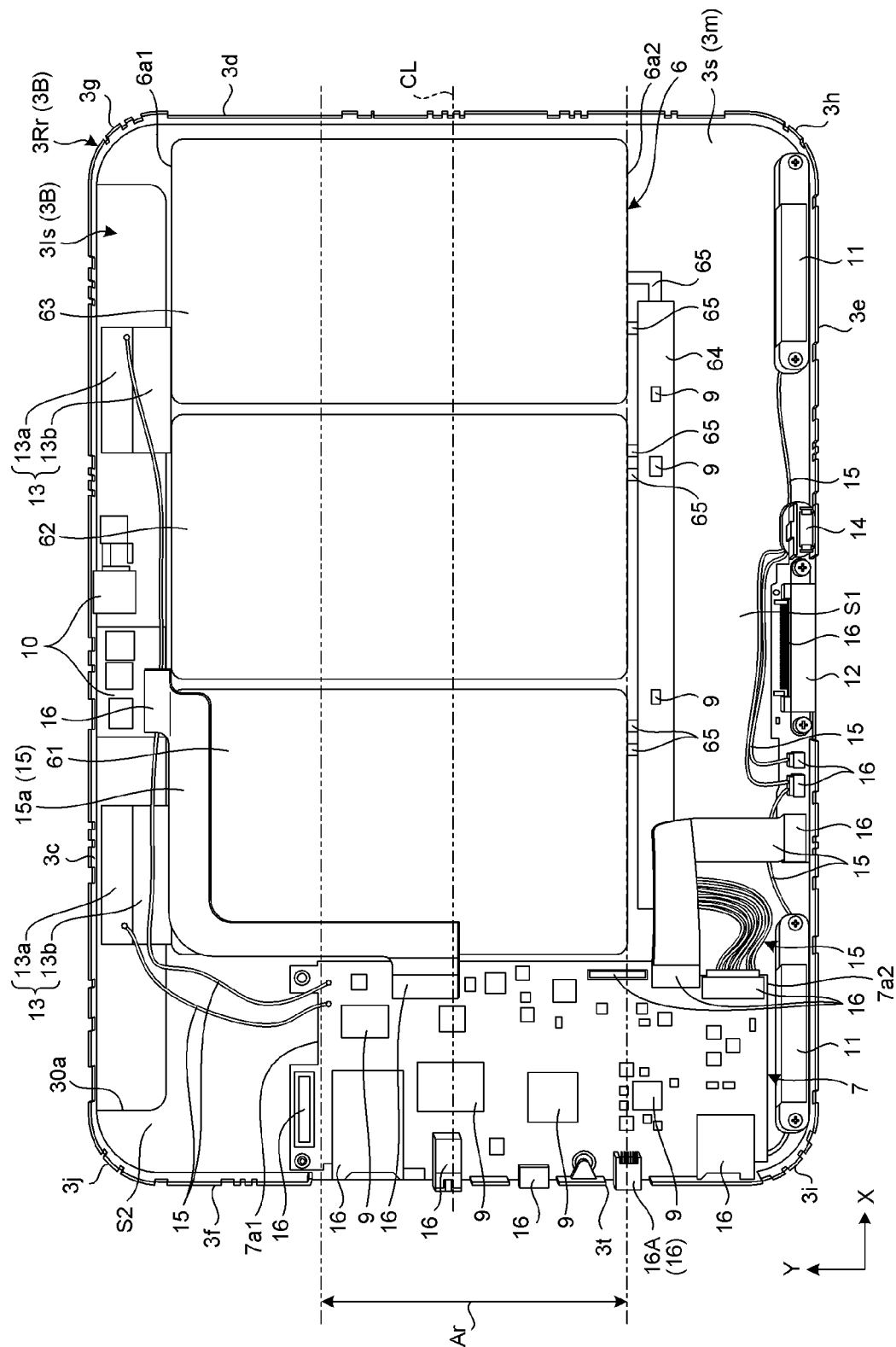


FIG. 23

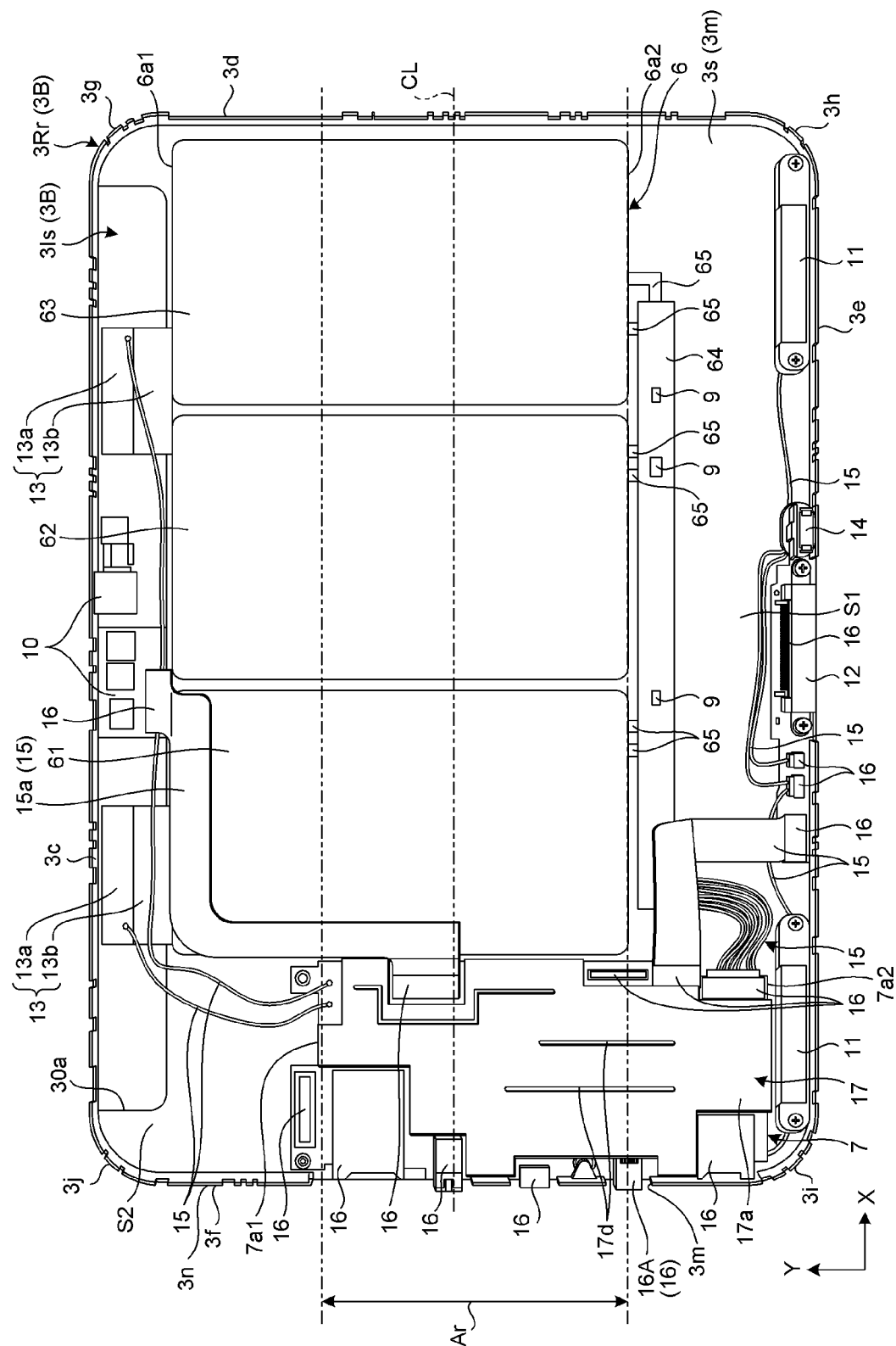


FIG. 24

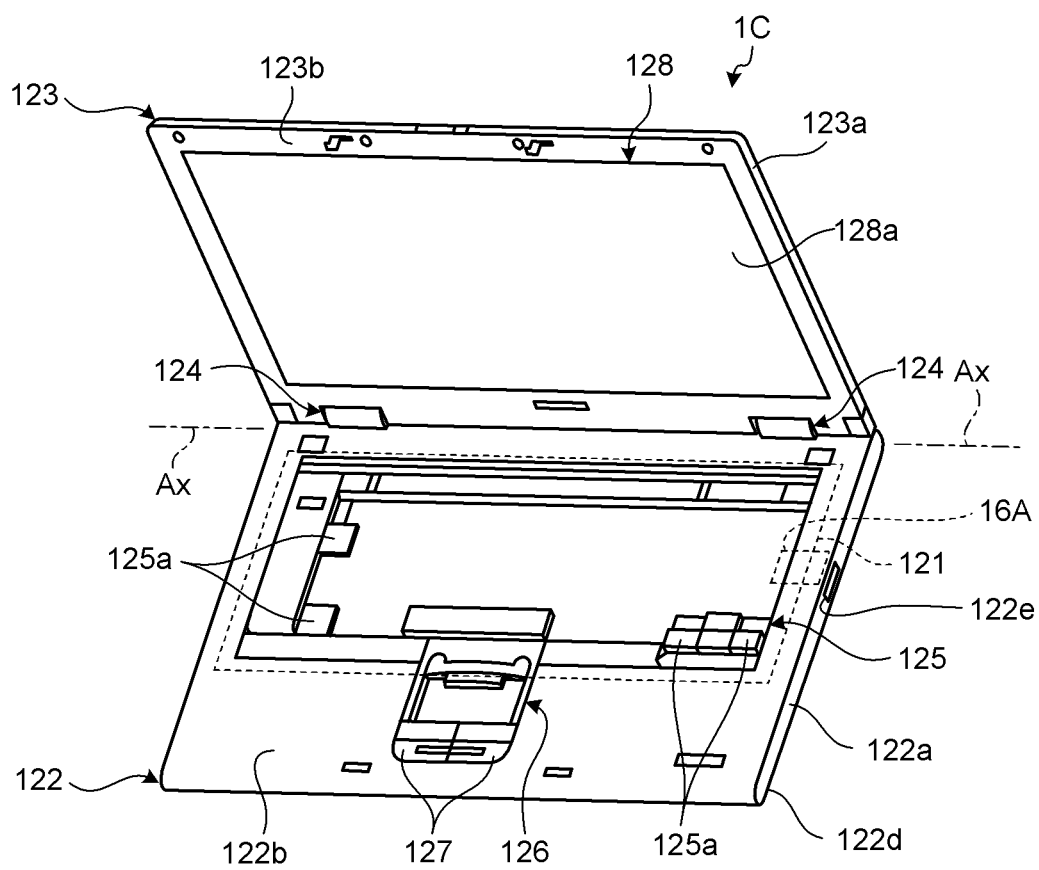


FIG. 25

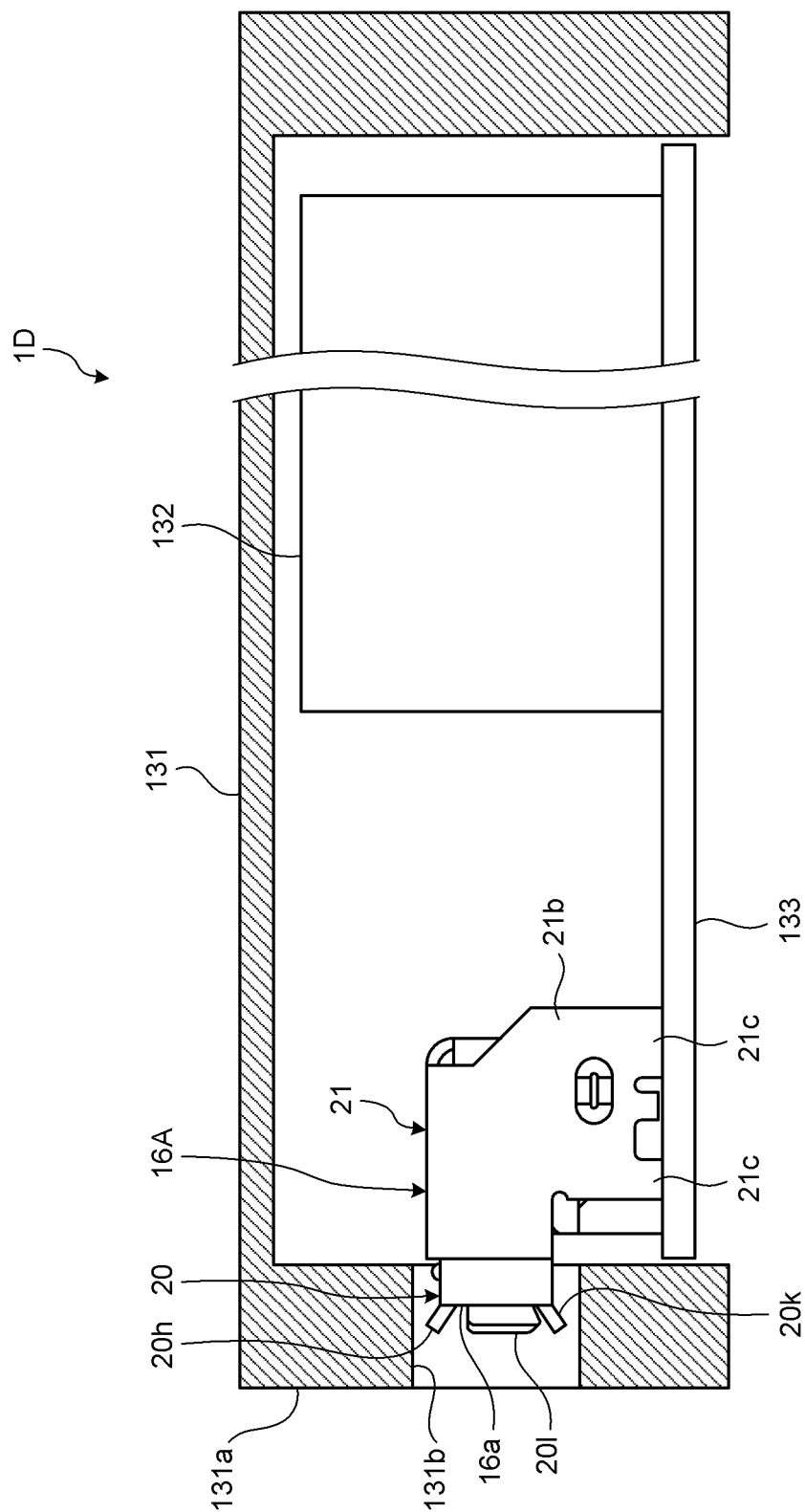


FIG.26

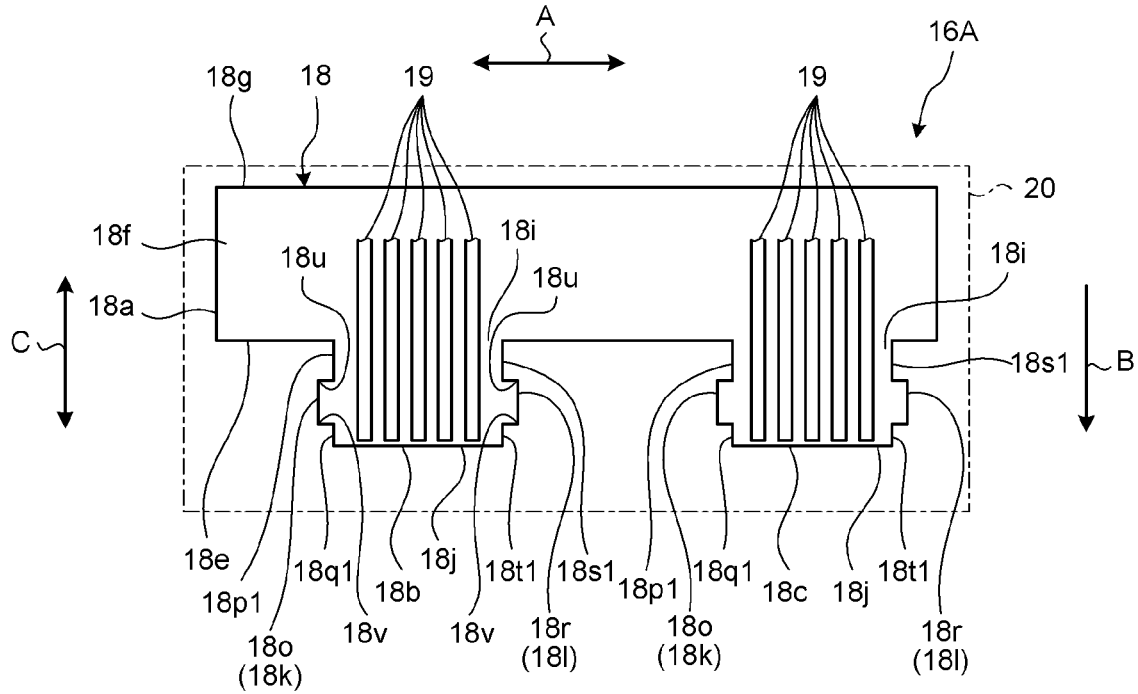


FIG.27

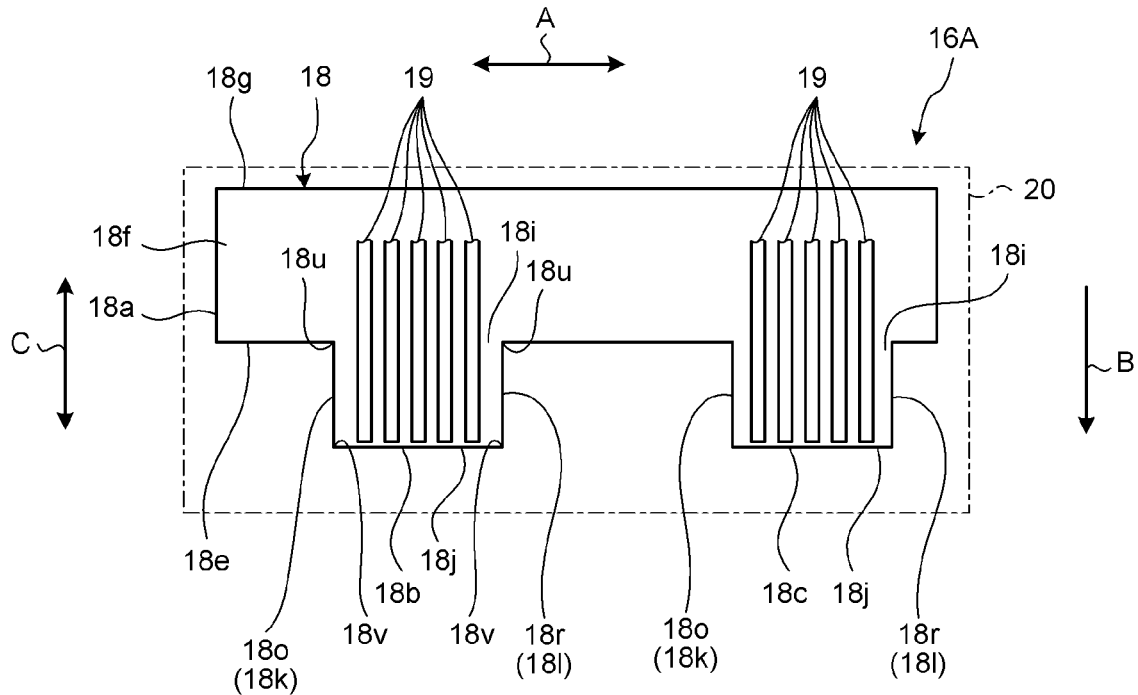


FIG. 30

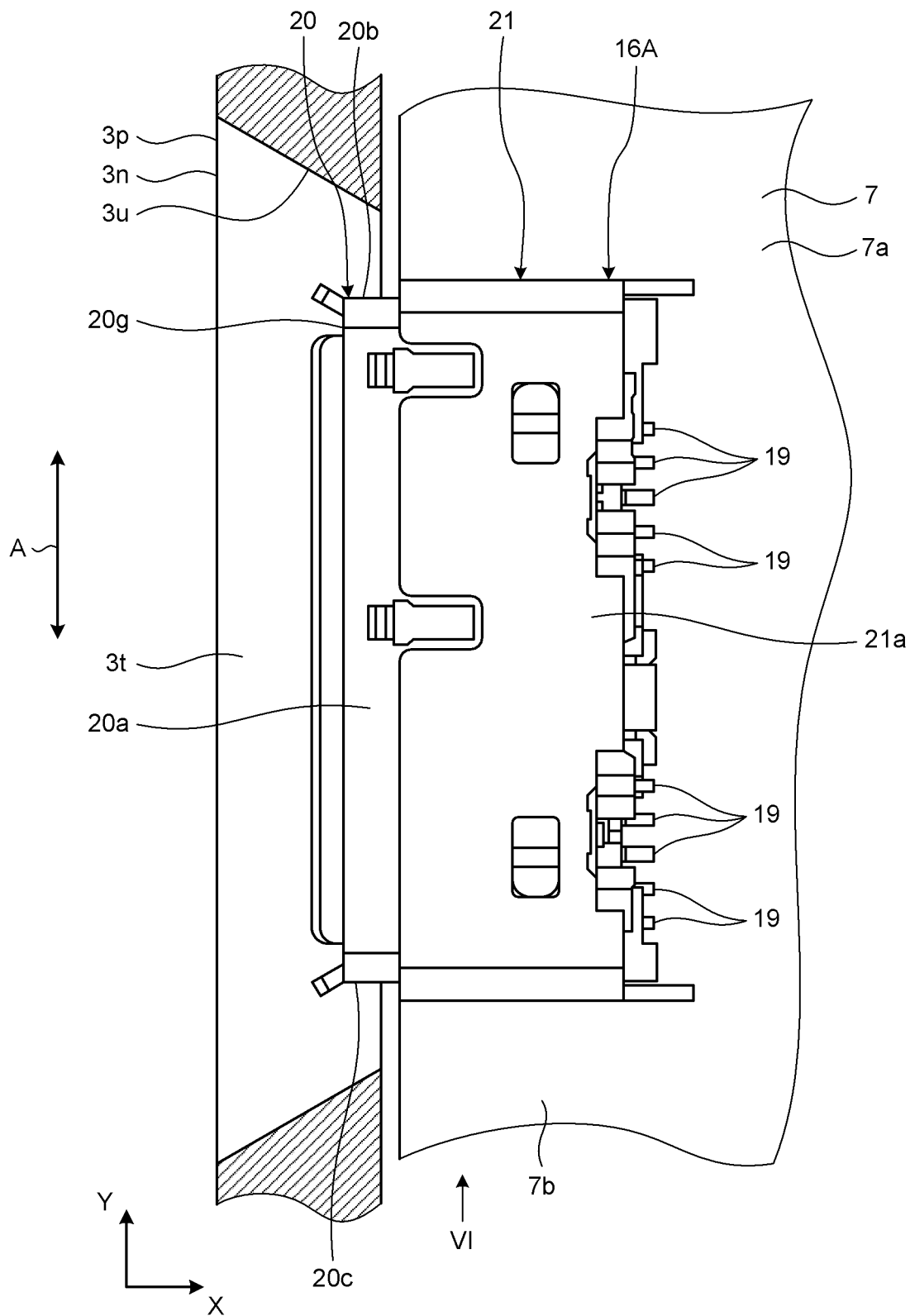
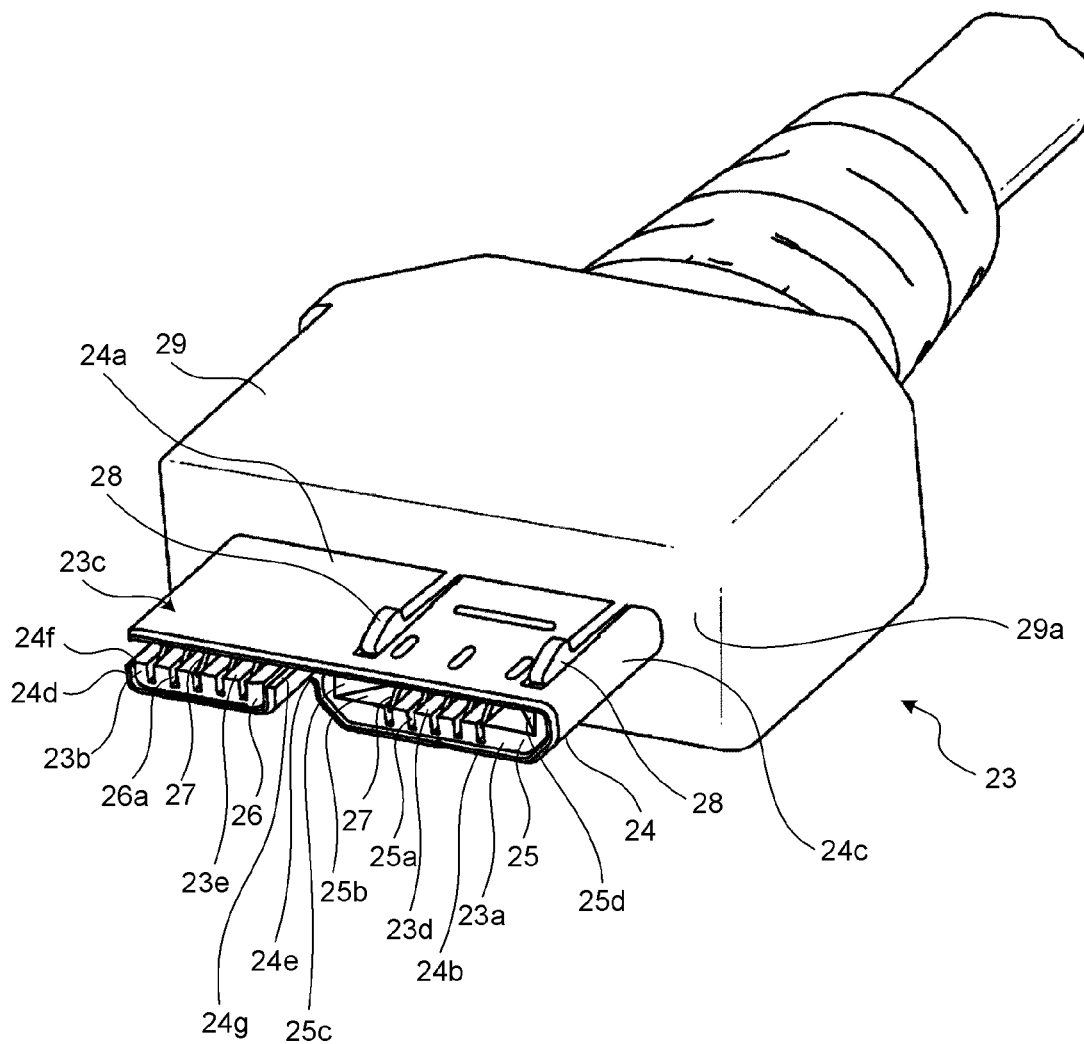


FIG.31



1

TELEVISION RECEIVER AND ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the benefit of priority from Japanese Patent Application No. 2011-289630, filed on Dec. 28, 2011, the entire contents of which are incorporated herein by reference.

FIELD

Embodiments described herein relate generally to a television receiver and an electronic device.

BACKGROUND

Conventionally known is a television receiver or an electronic device comprising a connector to which an external connector is connected.

There has been desired to prevent a connector on a television receiver or an electronic device from being damaged.

BRIEF DESCRIPTION OF THE DRAWINGS

A general architecture that implements the various features of the invention will now be described with reference to the drawings. The drawings and the associated descriptions are provided to illustrate embodiments of the invention and not to limit the scope of the invention.

FIG. 1 is an exemplary front view of a television receiver according to a first embodiment;

FIG. 2 is an exemplary side view of the television receiver in the first embodiment;

FIG. 3 is an exemplary schematic diagram illustrating a cross section taken along the line III-III in FIG. 1, in the first embodiment;

FIG. 4 is an exemplary schematic diagram illustrating a cross taken along the line IV-IV in FIG. 1, in the first embodiment;

FIG. 5 is an exemplary cross-sectional view taken along the line V-V in FIG. 2, in the first embodiment;

FIG. 6 is an exemplary schematic diagram as viewed from the arrow VI in FIG. 5, in the first embodiment;

FIG. 7 is an exemplary perspective view of a connector on the television receiver in the first embodiment;

FIG. 8 is an exemplary schematic diagram as viewed from the arrow VIII in FIG. 7, in the first embodiment;

FIG. 9 is an exemplary schematic diagram of the connector of the television receiver in the first embodiment;

FIG. 10 is an exemplary perspective view of an external connector in the first embodiment;

FIG. 11 is an exemplary schematic diagram for explaining how the external connector is removed from the connector on the television receiver, in the first embodiment;

FIG. 12 is an exemplary schematic diagram of a connector and a circuit board in a television receiver according to a first modification of the first embodiment;

FIG. 13 is an exemplary schematic diagram of a connector and a circuit board in a television receiver according to a second modification of the first embodiment;

FIG. 14 is an exemplary schematic diagram of a connector and a circuit board in a television receiver according to a third modification of the first embodiment;

2

FIG. 15 is an exemplary schematic of a connector on a television receiver according to a fourth modification of the first embodiment;

FIG. 16 is an exemplary schematic of a connector on a television receiver according to a fifth modification of the first embodiment;

FIG. 17 is an exemplary schematic of a connector on a television receiver according to a sixth modification of the first embodiment;

FIG. 18 is an exemplary cross-sectional view of a television receiver according to a seventh modification of the first embodiment viewed from the same position as in FIG. 6;

FIG. 19 is an exemplary perspective view of an electronic device according to a second embodiment;

FIG. 20 is an exemplary rear view of the electronic device in the second embodiment;

FIG. 21 is an exemplary plan view (rear view) of an internal structure of the electronic device comprising a first member, in the second embodiment;

FIG. 22 is an exemplary plan view (front view) of the internal structure of the electronic device comprising a second member, in the second embodiment;

FIG. 23 is an exemplary plan view (front view) of the internal structure of the electronic device comprising the second member, with a cover provided on the circuit board, in the second embodiment;

FIG. 24 is an exemplary perspective view of an electronic device according to a third embodiment;

FIG. 25 is an exemplary cross-sectional view of an electronic device according to a fourth embodiment;

FIG. 26 is an exemplary schematic diagram of a connector according to a fifth embodiment;

FIG. 27 is an exemplary schematic diagram of a connector according to a sixth embodiment;

FIG. 28 is an exemplary schematic diagram of a connector according to a seventh embodiment;

FIG. 29 is an exemplary schematic diagram of a connector according to a modification of the seventh embodiment;

FIG. 30 is an exemplary cross-sectional view illustrating peripherals of a connector according to an eighth embodiment; and

FIG. 31 is an exemplary perspective view of an external connector according to a ninth embodiment.

DETAILED DESCRIPTION

In general, according to one embodiment, a television receiver comprises: a housing; a display; a circuit board; and a connector. The housing comprises a first opening and a second opening. The display comprises a rear surface and a display surface exposed through the first opening. The display is housed in the housing. The circuit board is on the rear surface side of the display, and in the housing. The connector is in the housing, exposed through the second opening, configured to be coupled to the circuit board, and configured to be connected with an external connector. The connector comprises: an insulating member; a plurality of terminal members; and a container. The insulating member comprises: a base portion; and an insertion portion extending from the base portion toward the second opening and configured to be inserted into a connection portion of the external connector. The terminal members are configured to be provided to the insertion portion, and to be coupled to the connection portion. The container is configured to house the insertion portion, and comprises one end at which the external connector is inserted. The insertion portion com-

prises: a side surface; and a slanted surface provided to at least one of ends of the side surface at the base portion side and the other one of the ends of the side surface. The slanted surface is slanted with respect to the side surface.

In exemplary embodiments described below, common elements are comprised. Therefore, in explanations below, the same reference numerals are assigned to the same elements, and redundant explanations thereof are partially omitted. In addition, in each of the drawings, directions (an X direction, a Y direction, and a Z direction) are illustrated for convenience. The X direction corresponds to the longitudinal direction of a display surface **4a** of in a front view. The Y direction corresponds to the short side direction of the display surface **4a** in the front view. The Z direction corresponds to the front-back direction of the display surface **4a** (depth direction, the thickness direction of a housing **3A**) in the front view. The X direction, the Y direction, and the Z direction perpendicularly intersect each other.

In the embodiments described below, explained as an example is an electronic device configured as a television receiver, a personal computer, or a magnetic disk device, but the electronic device according to the embodiments is not limited thereto. For example, the electronic device according to the embodiments may be various electronic devices such as a smartphone, a smartbook, a cellular phone, a personal digital assistant (PDA), a video display device, and a video phone.

A television receiver **1A** that is an example of an electronic device according to a first embodiment comprises a support **2A** (a supporting portion, a station, a stand) and the housing **3A**, as illustrated in FIGS. **1** and **2**. Specifically, the support **2A** is placed on a setting area such as a desk, a shelf, and a table (a setting surface not illustrated), and supports the housing **3A** at an upright position. To support the housing **3A**, the support **2A** may be fixed to the housing **3A**, or may be movable (rotatable, slidable) with respect to the housing **3A**. The support **2A** of the housing **3A** may be moved (rotated) by being tilted, swiveled, or pivoted, for example.

In the first embodiment, as an example, as may be understood from FIG. **1**, the housing **3A** has an external appearance of a rectangular shape (in the first embodiment, an oblong shape, as an example) in the front view (and the rear view). The housing **3A** is also a cuboid shape that is thin and flat in the front-back direction (the thickness direction of the housing **3A**, the Z direction), as illustrated in FIG. **2**. The housing **3A** comprises a front surface **3a** (a frontal surface, a surface, a surface portion) and a rear surface **3b** (aback surface, a surface, a surface portion) opposite the front surface **3a**. The front surface **3a** and the rear surface **3b** are laid approximately in parallel (in the first embodiment, in parallel, as an example). The housing **3A** also comprises four ends **3c** to **3f** (sides, edge portions) and four corners **3g** to **3j** (pointed portions, curved portions, ends) in the front view, as illustrated in FIG. **1**. The ends **3c** and **3e** are examples of longer sides. The ends **3d** and **3f** are examples of shorter

sides. The housing **3A** comprises a wall **3k** (a portion, a plate, a frame, a front wall, a frontal wall) including the front surface **3a**, and a wall **3m** (a portion, a plate, a rear wall, a back wall, a bottom wall, a second wall) including the rear surface **3b**. Each of the walls **3k** and **3m** has a rectangular shape (in the first embodiment, an oblong shape, as an example). The wall **3k** also has a frame-like shape, and the wall **3m** has a plate-like shape. The housing **3A** comprises four walls **3n** (portions, plates, side walls, end walls, standing walls, stretched portions, first walls) each of which includes a side surface **3p** (a surface, a circumferential

surface) and stretches across the wall **3k** and the wall **3m**. An opening **3r** having a rectangular shape is provided to the wall **3k**.

The housing **3A** is made up from a combination of a plurality of portions (divided portions, members). The housing **3A** comprises a first member **3Fr** (a first portion, a front side member, a cover, a bezel, a frame) including at least the wall **3k**, and a second member **3Rr** (a second portion, a rear side member, a base, a bottom, a plate) at least including the wall **3m**, as an example. In the first embodiment, the walls **3n** are configured as a part of the first member **3Fr**. Each of the walls **3n** stretches across an end **3n1** (one end, a front end, the front surface **3a**) located on the side of the opening **3r** in the thickness direction of the housing **3A**, and an end **3n2** (the other end, a rear end, the rear surface **3b**) located opposite the end **3n1** and covers the circumference (a side surface **4b**, see FIGS. **3** and **4**) of a display device **4**.

In the first embodiment, as an example, the first member **3Fr** is made of a synthetic resin material, and the second member **3Rr** is made of a metallic material. Because the walls **3n** are included in the first member **3Fr**, as mentioned earlier, if the first member **3Fr** is to be made of a metallic material having a higher specific gravity than that of a synthetic resin material, the housing **3A** could become heavy. Furthermore, because the walls **3n** are not included in the second member **3Rr**, if the second member **3Rr** is to be made of a synthetic resin material that is softer (easily bent, deformed) than a metallic material, the stiffness of the housing **3A** could be reduced. Because, in the first embodiment, the first member **3Fr** is made of a synthetic resin material and the second member **3Rr** is made of a metallic material, as an example, the housing **3A** can be reduced in weight, while ensuring the stiffness and the strength of the housing **3A**. Such a combination of the materials (properties of the materials) is merely an example, and other combinations of materials may also be used.

In the first embodiment, as an example, as illustrated in FIGS. **3** and **4**, the display device **4** (a display module, a display, a panel, a display component) is housed in the housing **3A**. Specifically, the display surface **4a** (a display screen, a display, a first surface, an area, a portion, a region, a wall) of the display device **4** located on the side of the front surface **3a** is exposed to the front side (outside) of the housing **3A** through the opening **3r**. In other words, the display surface **4a** is exposed through the opening **3r**. The display device **4** includes the display surface **4a** and a rear surface **4d** located opposite the display surface **4a**. A user of the display can view the display surface **4a** from the front side through the opening **3r**. The display device **4** has an external appearance of a rectangular shape (in the first embodiment, an oblong shape, as an example) in the front view. The display device **4** also has a cuboid shape that is thin and flat in the front-back direction. The display device **4** is a liquid crystal display (LCD), an organic electroluminescent display (GELD), or a plasma display panel (PDP), for example.

In the first embodiment, as an example, as illustrated in FIGS. **3** and **4**, a transparent, relatively thin, and rectangular input operation panel **5** (as an example, a touch panel, a touch sensor, an operation surface) is provided to the front side (the frontal side, the side of the wall **3k**) of the display device **4**. The input operation panel **5** covers the display surface **4a**. An operator (e.g., a user) can make inputs by making operations such as touching, pressing, rubbing the input operation panel **5**, or moving a hand, a finger, or a stylus near the input operation panel **5**. Light output from the display surface **4a** of the display device **4** penetrates through

5

the input operation panel 5 and travels toward the front side (outside) of the housing 3A through the opening 3r on the wall 3k. The input operation panel 5 is an example of an input module.

In the first embodiment, as an example, as illustrated in FIGS. 3 and 4, the display device 4 and the input operation panel 5 are supported by the first member 3Fr. Specifically, the display device 4 and the input operation panel 5 are fixed to the first member 3Fr with fixtures (fixing portions, clamps, e.g., screws, clamps, or portions, not illustrated), an adhesive (e.g., an adhesive agent, or double-sided adhesive tape, not illustrated), and the like. The display device 4 and the input operation panel 5 are fixed to the wall 3k or the wall 3n (the end 3n1 of the wall 3n). In the first embodiment, as an example, an end 32a (a surface, an end) of the first member 3Fr (the wall 3n of the first member 3Fr) that is located on the front side is laid along and continuously to a surface 5a (a front surface, a frontal surface) of the input operation panel 5. In the first embodiment, as an example, the front surface 3a of the wall 3k and the display surface 4a of the display device 4 are also laid continuously, and the front surface 3a and the display surface 4a are covered by the input operation panel 5.

In the first embodiment, as an example, as illustrated in FIGS. 3 and 4, a battery 6 (a cell, an assembled battery) and circuit boards 7 and 8 (a board, a printed board, a control board; the circuit board 8 is not illustrated in FIGS. 3 and 4) and the like that are electric components are housed behind the display device 4 (on the side closer to the rear surface 4d, behind side, back side, the side of the wall 3m, the opposite side of the display surface 4a) in the housing 3A. The electric components such as the battery 6, the circuit boards 7 and 8, and the display device 4 are electrically connected to each other via wiring (e.g., a cable, a flexible cable, and a flexible printed wiring board) not illustrated.

In the first embodiment, as an example, the battery 6 may be configured as a lithium-ion secondary battery. A lithium-ion secondary battery is a type of a non-aqueous electrolyte battery, and lithium ions in the electrolyte conduct electricity. Manganese, nickel, or iron phosphate is used as a cathode material, and an oxide material such as lithium titanium oxide (LTO) or a carbon material is used as an anode material. Used as electrolyte (an electrolyte solution, as an example) is an organic solvent, for example, such as ethylene carbonate or diethyl carbonate in which a lithium salt such as fluorine-based complex salt (LiBF₄) is dissolved. In the first embodiment, as an example, the battery 6 is capable of supplying power that is required for enabling the television receiver 1A to operate, e.g., display videos and output sound, to the circuit boards 7 and 8, to the electric components in the housing 3A, such as the display device 4 and a speaker (not illustrated), etc. The battery 6 is also capable of supplying power to an external device connected to the circuit boards 7 and 8 via a connector and wiring, for example.

In the first embodiment, as an example, the battery 6 comprises a plurality of cells 61, 62, and 63, as illustrated in FIG. 1. The cells 61, 62, and 63 are electrically connected serially or in parallel. The cells 61, 62, and 63 are positioned side by side along the end 3c. In the first embodiment, as an example, the battery 6 comprises a circuit board 64. The electrodes (not illustrated) of the respective cells 61, 62, and 63 are connected (joined) to the circuit board 64 (conductor pattern of the circuit board 64), and, in this manner, the cells 61, 62, and 63 are integrated. Because the cells 61, 62, and 63 are integrated, production labors and costs can be reduced compared with a structure in which the cells 61, 62, and 63

6

are individually assembled. The circuit board 64 comprises a bus bar (a conductor, not illustrated) that electrically connects the circuit boards 7 and 8 to each of the cells 61, 62, and 63, or between the cells 61, 62, and 63, as an example. Electric components (not illustrated) are provided (implemented) to the circuit board 64. The electric components and the conductor pattern (wiring pattern not illustrated) on the circuit board 64 together form an electric circuit (an electronic circuit) that realizes a function for monitoring an output power (voltage), temperature, and the like of each of the cells 61, 62, and 63 or the battery 6, as an example.

Each of the cells 61, 62, and 63 is configured as an independent single cell comprising a chamber (an container) in which an electrolyte (an electrolyte solution), electrodes, a separator, and the like are housed (contained). Each of the cells 61, 62, and 63 has a cuboid shape (a plate-like shape, a rectangular plate-like shape, a card-like shape) that is thin and flat in the thickness direction of the housing 3A (the Z direction). In the first embodiment, as an example, each of the cells 61, 62, and 63 are covered by an insulating, flexible, sheet-like covering (a skin, a film) that is the outmost layer, without any hard casing (a shell). Therefore, according to the first embodiment, as an example, because the battery 6 has no casing, the battery 6 (the cells 61, 62, and 63) can be reduced in size (thickness) and weight. Therefore, the housing 3A (the television receiver 1A) can be configured small (thin) and light-weighted. In the first embodiment, as an example, each of the cells 61, 62, and 63 is configured as a bag (a part) partitioned from the others. Therefore, as an example, a local stress applied to the battery 6, because of an external force and the like, can be reduced, compared with a structure in which the cells 61, 62, and 63 are firmly coupled integrally.

In the first embodiment, as an example, a plurality of components 9 (parts, elements, electronic components, electric components) such as a central processing unit (CPU) are implemented on at least one of the circuit boards 7 and 8. The components 9 include heating elements. A cooling mechanism (a heat radiator or a heat receiving element not illustrated) may be provided to an electronic component 9 (a heating element) that generates a large amount of heat. The circuit boards 7 and 8, the components 9, and the like form at least a part of a controlling circuit (not illustrated). The controlling circuit may comprise a video signal processing circuit, a tuner, a high-definition multimedia interface (HDMI) signal processor, an audio-video (AV) input terminal, a remote controller signal receiver, a controller, a selector, an on-screen display, a storage (e.g., a read-only memory (ROM), a random access memory (RAM), a hard disk drive (HDD)), an audio signal processing circuit, and the like. The controlling circuit controls video outputs (e.g., moving images or still images) from the display surface 4a of the display device 4, sound outputs from a speaker (not illustrated), and light emissions from a light emitting diode (LED) (not illustrated). The display device 4, the speaker, the LED, and the like are examples of an output module.

In the first embodiment, as illustrated in FIGS. 5 and 6, a first connector 16A, being a connector 16, is provided (implemented) to an implementation surface 7a (a surface, one surface, a first surface) of the circuit board 7. The first connector 16A is a connector complying with the Universal Serial Bus (USB) 3.0 Micro-B, as an example. The first connector 16A is provided to an end 7b (an edge portion, a side) of the circuit board 7, as an example. The first connector 16A is exposed through an opening 3t (an orifice, a hole) provided to the walls 3n of the housing 3A. The

7

opening **3t** is an example of a second opening. The walls **3n** are an example of a side wall.

As illustrated in FIGS. 7 and 8, the first connector **16A** comprises an insulating member **18** (a body, a backbone member, a supporting member, a support, a holding member, a holding portion), a plurality of terminal members **19** (implemented portions, fixed portions, junctures, supports, supporting portions, connected portions, connection portions, continuous portions, concatenated portions, continuing portions, running portions, terminals, electrode members, electrodes), a container **20** (a member, a backbone member, a frame, a portion, a shell, a metallic member), and a supporting member **21** (a member, a backbone member, a frame, a portion). The first connector **16A** comprises two (a plurality of) fitting portions **16a** and **16b** (engage portions, insertion portions, connection portions). The fitting portion **16a** comprises an insertion portion **18b**, and the fitting portion **16b** includes an insertion portion **18c**. An external connector (a connector, a counterpart connector, the other connector, another connector, a plug connector (see FIG. 10)) is connected to the first connector **16A**.

The insulating member **18** is made of an insulating material such as a resin, and has an insulating property. As illustrated in FIGS. 6, 8, and 9, the insulating member **18** comprises a base portion **18a** (a portion, a first portion), two of the insertion portions **18b** and **18c** (portions, second portions), and an elevating portion **18d** (a portion, a third portion, a foot portion, a foot).

The base portion **18a** has a cuboid shape. The base portion **18a** comprises four surfaces **18e**, **18f**, **18g**, and **18h** extended along the longitudinal direction of the base portion **18a** (in the direction of the arrow A illustrated in FIGS. 8 and 9).

The insertion portions **18b** and **18c** extend from the base portion **18a**. More specifically, the insertion portions **18b** and **18c** extend from the surface **18e** of the base portion **18a** toward the opening **3t**. The insertion portions **18b** and **18c** are inserted into a connection portion **23c** of an external connector **23**. The insertion portions **18b** and **18c** are positioned so as to be spaced apart from each other in the longitudinal direction of the base portion **18a**. Each of the insertion portions **18b** and **18c** has a flat shape. Each of the insertion portions **18b** and **18c** comprises a base end **18i** (an end, one of ends) located on a side of the base portion **18a**, and a tip end **18j** (an end, other one of the ends). Each of the insertion portions **18b** and **18c** comprises a pair of sides **18k** and **18l**, and a connecting portion **18m** connecting the pair of sides **18k** and **18l**. A plurality of recessed portions **18n** are provided to a portion of the connecting portion **18m** facing the circuit board 7, and the terminal members **19** are provided in the recessed portions **18n**, respectively.

The sides **18k** and **18l** are examples of portions (surface portions) that are brought in contact with the external connector **23** when the external connector **23** is connected to the first connector **16A**. The side **18k** comprises a side surface **18o** and two slanted surfaces **18p** and **18q**. The side **18l** comprises a side surface **18r** and two slanted surfaces **18s** and **18t**. The slanted surfaces **18p** and **18s** are provided to the side surfaces **18o** and **18r**, respectively, on the side of one end **18u** located closer to the base portion **18a**. The side surfaces **18o** and **18r** are examples of a portion extended along the direction in which the external connector **23** is inserted into or removed from the first connector **16A** (the direction along the arrow C in FIG. 9). The slanted surfaces **18q** and **18t** are provided to the side surfaces **18o** and **18r**, respectively, on the side of the other end **18v** located opposite the one end **18u**. The slanted surfaces **18p**, **18q**, **18s**, and **18t** are examples of a portion comprising a step

8

portion with respect to the portion extending along the direction in which the external connector is inserted into or removed (the side surface **18o** or **18r**). The slanted surfaces **18p**, **18q**, **18s**, and **18t** are examples of portions recessed from **18o** and **18r**.

In the first embodiment, the slanted surfaces **18p**, **18q**, **18s**, and **18t** are provided to both of one end **18u** and the other end **18v**, but embodiments are not limited thereto, and the slanted surfaces **18p**, **18q**, **18s**, and **18t** may be provided at least to one of the one end **18u** and the other end **18v**. Furthermore, in the first embodiment, the slanted surfaces **18p**, **18q**, **18s**, and **18t** are provided to both of the insertion portions **18b** and **18c**, but embodiments are not limited thereto, and the slanted surfaces **18p**, **18q**, **18s**, and **18t** may be provided to only one of the insertion portions **18b** and **18c**. The side surfaces **18o** and **18r** are laid along the direction in which the insertion portions **18b** and **18c** extend from the base portion **18a** (in the direction along the arrow B in FIG. 9).

Each of the slanted surfaces **18p** and **18q** is slanted with respect to the side surface **18o**, to reduce the width of the insertion portions **18b** and **18c** (the width along the longitudinal direction of the base portion **18a**) more as the slanted surfaces **18p** and **18q** extend further away from the side surface **18o**. Each of the slanted surfaces **18s** and **18t** is slanted with respect to the side surface **18r**, to reduce the width of the insertion portions **18b** and **18c** more as the slanted surfaces **18s** and **18t** extend further away from the side surface **18r**. Each of the slanted surfaces **18p** and **18s** is a flat surface, as an example. Each of the slanted surfaces **18q** and **18t** is a curved surface, as an example. The length of each of the slanted surfaces **18q** and **18t** provided to the other end **18v** is shorter than that of each of the slanted surfaces **18p** and **18s** provided to the one end **18u** in the direction in which the insertion portions **18b** and **18c** extend from the base portion **18a** (in the direction along the arrow B in FIG. 9).

The elevating portion **18d** comprises pins **18w** (portions, protrusions, foot portions, feet). The pins **18w** penetrate through the circuit board 7, and are fixed to the circuit board 7.

The terminal members **19** are made of copper alloy, as an example, with a surface plated with gold, silver tin, nickel, and the like, and have a conductive property. The terminal members **19** are provided to the insulating member **18** by insert molding or pressure molding, for example. The terminal members **19** are provided to each of the insertion portions **18b** and **18c**, and are electrically connected to the connection portion **23c** of the external connector **23**. The terminal members **19** are also electrically connected to the circuit board 7. The terminal members **19** are fixed to the circuit board 7 by solder (not illustrated).

The container **20** is made of a metallic material, as an example, and has a tube-like shape. The insertion portions **18b** and **18c** are housed in the container **20**. The container **20** is joined (connected) to the insulating member **18**. The elevating portion **18d** of the insulating member **18** is positioned outside of the tube of the container **20**. The container **20** comprises a top plate **20a** (a portion, a first portion), a bottom **20b** (a portion, a second portion), and a pair of sides **20c** and **20d** (portions, third portions). Provided to the bottom **20b** is a protrusion **20e** protruding toward the top plate **20a**. There is a space provided between the container **20** and the insertion portions **18b** and **18c**, and the external connector **23** is inserted into the space. An opening **20f** is formed on one end **20g** of the container **20**, and the external connector **23** is connected through the opening **20f** (the one

9

end 20g). Guides 20h, 20i, 20j, 20k, and 20l (parts, protrusions, inclined portions) are provided to the one end 20g.

The supporting member 21 is made of a metallic material or an insulating material. The supporting member 21 supports the insulating member 18 and the container 20. The supporting member 21 also covers the insulating member 18 and the container 20. The supporting member 21 comprises a top plate 21a, a pair of sides 21b, and a rear surface 21c. Pins 21d (feet, foot portions, portions) are provided to the rear surface 21c and the pair of sides 21b. The pins 20d penetrate through the circuit board 7, and are fixed to the circuit board 7.

In the first embodiment, as illustrated in FIG. 6, as an example, the portion 16a of the first connector 16A including the one end 20g of the container 20 projects out from the circuit board 7. A portion 1a includes a portion of the container 20 exposed from the top plate 21a, as an example. In the first embodiment, as an example, the one end 20g of the container 20 is positioned in the opening 3t. In the first embodiment, as an example, tip ends 18x that are portions of the respective insertion portions 18b and 18c are also positioned in the opening 3t.

A method of manufacturing the first connector 16A in the structure described above (a connector manufacturing method) comprises: resin-molding the insulating member 18 with a molding machine; and attaching the insulating member 18 thus molded and the container 20 to the supporting member 21. The insulating member 18 is press-fitted into the container 20, as an example. The molding machine includes dies.

As illustrated in FIG. 10, the external connector 23 comprises a shell 24 (a member, a backbone member, a frame, a portion, a metallic member), insulating members 25 and 26 (bodies, backbone members, supporting members, supports, holding members, holding portions), a plurality of terminal members 27 (implemented portions, fixed portions, junctures, supports, supporting portions, connected portions, connection portions, continuous portions, concatenated portions, continuing portions, running portions, terminals, electrode members, electrodes), engage portions 28 (claws, claw portions, protrusions), and a base portion 29 (a body, a portion). The external connector 23 also comprises two (a plurality of) fitting portions (engage portions, insert portions, connection portions) 23a and 23b. The fitting portions 23a and 23b fits into (engage with) the respective fitting portions 16a and 16b on the first connector 16A. The shell 24, the insulating members 25 and 26, the terminal members 27 make up the connection portion 23c.

The insulating members 25 and 26 are made of an insulating material such as a resin, and have an insulating property. A plurality of recessed portions 25a and 26a are provided to the respective insulating members 25 and 26, and the terminal members 27 are provided to the respective recessed portions 25a and 26a. A recessed portion 25b is provided in the insulating member 25. The recessed portions 25a are provided to the bottom surface of the recessed portion 25b.

The terminal members 27 are made of copper alloy, as an example, with a surface plated with gold, silver tin, nickel, and the like, and have a conductive property. The terminal members 19 are electrically connected to the respective terminal members 19 of the first connector 16A.

The shell 24 is made of a metallic material, as an example. The shell 24 has a tube-like shape, and the insulating members 25 and 26 are housed in the shell 24. The shell 24 comprises a top plate 24a (a portion, a first portion), a bottom 24b (a portion, a second portion), and a pair of sides

10

24c and 24d (portions, third portions). A protrusion 24e protruding toward the top plate 24a is formed on the bottom 24b. The internal space (in the tube) of the shell 24 is partitioned into two spaces by the protrusion 24e, and the insulating member 25 is arranged in one of the spaces, and the insulating member 26 is arranged in the other space. The external connector 23 comprises an opening 23d (an orifice, a recessed portion) surrounded by the recessed portion 25b of the insulating member 25 and the top plate 24a, and an opening 23e (orifice, recessed portion) surrounded by the insulating member 26, the top plate 24a, the side 24d, and the protrusion 24e. The insertion portions 18b is inserted into the opening 23d, and the insertion portion 18c is inserted into the opening 23e. The two engage portions 28 are provided to the top plate 24a of the shell 24. The engage portions 28 are engaged with the engage portions provided to the top plate 20a of the first connector 16A, when the insertion portions 18b and 18c are inserted into the respective openings 23d and 23e.

The base portion 29 has a cuboid shape. The shell 24, the insulating members 25 and 26, and the engage portions 28 protrude from one surface 29a of the base portion 29.

To remove the external connector 23 having the structure described above from the first connector 16A, as an example, as illustrated sequentially in FIG. 11, when the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend (the direction of the arrow B), the slanted surfaces 18p, 18q, 18s, and 18t permit such a diagonal movement of the external connector 23. As an example, the slanted surfaces 18p, 18q, 18s, and 18t of the insertion portions 18b also permit a diagonal movement of the recessed portion 25b. The slanted surfaces 18p, 18q, 18s, and 18t of the insertion portions 18b also permit a diagonal movement of the side 24d and the protrusion 24e.

As explained above, in the first embodiment, when the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, the slanted surfaces 18p, 18q, 18s, and 18t permit such a diagonal movement of the external connector 23. Therefore, even if the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, the external connector 23 is prevented from pressing the insertion portions 18b and 18c in a direction bending the insertion portions 18b and 18c. Hence, concentration of stress on the insertion portions 18b and 18c can be suppressed, and therefore, the insertion portions 18b and 18c can be suppressed from being damaged. Furthermore, when the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, because the slanted surfaces 18p, 18q, 18s, and 18t permit the diagonal movement of the external connector 23, the external connector 23 can be removed from the first connector 16A more easily.

In the first embodiment, a plurality of components 9 such as CPU may be implemented on the circuit board 7. A cooling mechanism may be provided to the components 9 implemented on the circuit board 7, as an example. In the first embodiment, because a load applied to the first connector 16A when the external connector 23 is removed is reduced, a load applied to the components 9 when the

11

external connector 23 is removed can also be reduced. Therefore, the components 9 may be arranged near the external connector 23.

Modifications of first embodiment will now be explained. The first connector 16A according to a first modification illustrated in FIG. 12 is entirely positioned in the housing 3A.

The first connector 16A according to a second modification illustrated in FIG. 13 is positioned in a recessed portion 7d provided to the circuit board 7. In this manner, an amount in which the first connector 16A protrudes from the implementation surface 7a of the circuit board 7 can be made relatively small.

The first connector 16A according to a third modification illustrated in FIG. 14 is provided to a protrusion 7e formed on an end 7b of the circuit board 7. In this manner, the circuit board 7 can be prevented from being increased in size, while ensuring the first connector 16A to be positioned in the opening 3t.

In the first connector 16A according to the fourth modification illustrated in FIG. 15, the slanted surfaces 18q and 18t are flat.

In the first connector 16A according to a fifth modification illustrated in FIG. 16, among the terminal members 19 provided to the insertion portions 18b and 18c, the terminal members 19 located on both ends of each of the insertion portions 18b and 18c have a smaller width than that of the others. In this manner, the distance between each of the slanted surfaces 18p, 18q, 18s, and 18t and the terminal members 19 can be increased relatively.

In the first connector 16A according to a sixth modification illustrated in FIG. 17, the terminal members 19 on the both of the ends of each of the insertion portions 18b and 18c are provided at a pitch narrower than that in the center. For convenience, the terminal members 19 are said to be, from the one on the left to the one on the right in FIG. 17, a first terminal member 19A, a second terminal member 19B, a third terminal member 19C, a fourth terminal member 19D, and a fifth terminal member 19E. A pitch P2 between the first terminal member 19A and the second terminal member 19B and the pitch P2 between the fourth terminal members 19D and the fifth terminal members 19E are narrower than the pitch P1 between the second terminal members 19B and the third terminal members 19C. In this manner, the distance between each of the slanted surfaces 18p, 18q, 18s, and 18t and the terminal members 19 can be increased relatively.

In the first connector 16A according to a seventh modification illustrated in FIG. 18, an end 20m of the side 20c and the end 20m of the side 20d, both of which is on the one end 20g of the container 20, are positioned closer to the base portion 18a than an end 20n of the top plate 20a and an end 20o of the bottom 20b. In this manner, even if the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, the external connector 23 can be suppressed from pressing the insertion portions 18b and 18c in a direction bending the insertion portions 18b and 18c. Therefore, the insertion portions 18b and 18c can be suppressed from being damaged.

An electronic device 1B according to a second embodiment is a personal computer, a television receiver, a smartphone, a smartbook, a cellular phone, a PDA, or the like, such as a so-called slate-type or a tablet type display device having a surface of software keyboard.

In the second embodiment, as an example, as may be understood from FIGS. 19 and 20, a housing 3B of the electronic device 1B has an external appearance of a rect-

12

angular shape (in the second embodiment, an oblong shape, as an example) in the front view and the rear view. The housing 3B is also in a cuboid shape that is thin and flat in the front-back direction (the thickness direction of the housing 3B, the Z direction). The housing 3B comprises the front surface 3a (a frontal surface, a surface, a surface portion) and a rear surface 3b (a back surface, a surface, a surface portion) located on the opposite side of the housing 3B. The front surface 3a and the rear surface 3b are laid approximately in parallel (in the second embodiment, in parallel, as an example). The housing 3B also comprises four ends 3c to 3f (sides, edge portions) and four corners 3g to 3j (pointed portions, curved portions, ends) in the front view. The ends 3c and 3e are examples of longer sides. The ends 3d and 3f are examples of shorter sides.

The housing 3B comprises a wall 3k (a portion, a plate, a frame, a front wall, a frontal wall, a top wall) including the front surface 3a, and a wall 3m (a portion, a plate, a rear wall, a back wall, a bottom wall, a second wall) including the rear surface 3b. Each of the walls 3k and 3m has a rectangular shape (in the second embodiment, an oblong shape, as an example). The housing 3B comprises four walls 3n (portions, plates, side walls, end walls, standing walls, stretched portions, first walls) each of which includes a side surface 3p (a surface, a circumferential surface) and stretches across the wall 3k and the wall 3m. An opening 3r having a rectangular shape, as an example, is formed on the wall 3k.

The housing 3B may be made from a combination of a plurality of parts (divided portions). The housing 3B comprises a first member 3Fr (a first portion, a front side member, a cover, a bezel, a frame) including at least the wall 3k, and a second member 3Rr (a second portion, a rear side member, a base, a bottom, a plate) at least including the wall 3m, as an example. In the second embodiment, the walls 3n are basically configured as a portion of the first member 3Fr. In other words, each of the walls 3n stretches across an end 3n1 (one end, a front end, the front surface 3a) located on the side of the opening 3r in the thickness direction of the housing 3B and an end 3n2 (the other end, a rear end, the rear surface 3b) located on the opposite side of the end 3n1 (see FIG. 19), and covers the circumference of the display device 4 (the side surface 4b). The walls 3n are thicker than the other walls 3k and 3b. Therefore, the stiffness and the strength in the thickness direction of the housing 3B can be increased easily.

In the second embodiment, as an example, the first member 3Fr is made of a synthetic resin material, and the second member 3Rr is made of a metallic material. Therefore, according to the second embodiment, the weight of the housing 3B can be reduced while ensuring the stiffness and the strength of the housing 3B, in the same manner as in the first embodiment. Such a combination of the materials (properties of the materials) is merely an example, and other combinations of materials may also be used.

As illustrated in FIG. 19, a groove 32b extending along the ends 3c to 3f is formed in the middle (at the center) of the thickness direction of the outer surface of the walls 3n. A member 32c extending along the groove 32b is enclosed (embedded) in at least a portion of the groove 32b. The walls 3n and the member 32c may be made of different materials or have different colors. By configuring the member 32c as a member harder than the walls 3n, as an example, the walls 3n is reinforced. By contrast, by configuring the member 32c as a member that is softer than the walls 3n (as an example, a flexible member), the bendability (flexibility) of the walls 3n is increased, and the member 32c can absorb impacts

13

better, as an example. In a portion of the groove **32b**, an operation module **32d** such as a switch may be provided, instead of the member **32c**. Examples of the switch for the operation module **32d** include a power switch, a volume control switch, and a reset switch. The member **32c** and the operation module **32d** may protrude from the walls **3n** by the same height. Such a configuration can make the operation module **32d** visually less prominent. Furthermore, because the member **32c** and the operation module **32d** are provided continuously, aesthetic quality can be improved.

In the second embodiment, as an example, as illustrated in FIGS. **19** and **21**, the display device **4** (a display module, a display, a panel, a display component) is housed in the housing **3B**. Specifically, the display surface **4a** of the display device **4** located on the side of the front surface **3a** is exposed to the front side (outside) of the housing **3B** through the opening **3r**. A user can view the display surface **4a** from the front side through the opening **3r**. The display device **4** has an external appearance of a rectangular shape (in the second embodiment, an oblong shape, as an example) in the front view. The display device **4** has a cuboid shape that is thin and flat in the front-back direction. The display device **4** is a LCD, an GELD, or a PDP, for example. In the second embodiment, as an example, a transparent, relatively thin, and rectangular input operation panel **5** (as an example, a touch panel, a touch sensor, an operation surface) is provided to the front side (the frontal side, the side of the wall **3k**) of the display device **4**, in the same manner as in the first embodiment. In the second embodiment, the display device **4** and the input operation panel **5** are supported by the first member **3Fr**, in the same manner as in the first embodiment.

In the second embodiment, as an example, as illustrated in FIGS. **21** to **23**, as electric components, the battery **6** (a cell, an assembled battery), the circuit board **7** (a circuit board, a printed board, a control board), a camera module **10** (a camera unit, a camera assembly, an image capturing device), a speaker module **11** (a speaker unit, a speaker assembly, an audio output device), a connector module **12** (a connector unit, a connector assembly, a connector device), an antenna module **13** (an antenna unit, an antenna assembly, an antenna device), an oscillation generating module **14** (a motor having a rotating shaft to which an eccentric weight is attached), and the like are housed behind the display device **4** (on the side of the rear surface, behind side, back side, the side closer to the wall **3m**, on the opposite side of the display surface **4a**) in the housing **3B**. These electric components are electrically connected to the other electric components via wiring **15** (e.g., a cable, a flexible cable, a flexible printed wiring board).

In the second embodiment, as an example, the battery **6** may be configured as a lithium-ion secondary battery. In the second embodiment, as an example, the battery **6** is capable of supplying power that is required for enabling the electronic device **1B** to operate, e.g., display videos and output sound, to the display device **4** and electric components installed in the housing **3B** via the connector **16** and the wiring **15**, for example. The battery **6** is also capable of supplying power to an external device connected to the circuit board **7** and the like via the connector **16** and the wiring **15**, for example.

In the second embodiment, as an example, the battery **6** comprise a plurality of cells **61**, **62**, and **63**, as illustrated in FIGS. **22** and **23**. The cells **61**, **62**, and **63** are arranged side by side along the end **3c**. In the second embodiment, as an example, the battery **6** comprises a circuit board **64**. Electrodes **65** of the respective cells **61**, **62**, and **63** are connected

14

(joined) to the circuit board **64** (conductor pattern of the circuit board **64**), and in this manner, the cells **61**, **62**, and **63** are integrated. Because the cells **61**, **62**, and **63** are integrated, production labors and costs can be reduced compared with a structure in which the cells **61**, **62**, and **63** are individually assembled. The circuit board **64** comprises a bus bar (a conductor) that electrically connects the circuit board **7** to each of the cells **61**, **62**, and **63**, or between the cells **61**, **62**, and **63**, as an example. The components **9** are provided (implemented) to the circuit board **64**. The components **9** and the conductor pattern (wiring pattern not illustrated) on the circuit board **64** together form an electric circuit (an electronic circuit) that realizes a function of monitoring an output power (voltage), temperature, and the like of each of the cells **61**, **62**, and **63** or the battery **6**, as an example.

In the second embodiment, as an example, the components **9** such as a CPU, a graphic controller, power circuit components, a platform controller hub (PCH), a memory slot connector, a LCD connector, an input/output (I/O) connector, a power coil, an element, a connector, and the like can be implemented on the circuit board **7**. The components **9** include heating elements. A cooling mechanism **17** (a cooling mechanism) may be provided to the circuit board **7** (the components **9** on the circuit board **7**).

In the second embodiment, as an example, the circuit board **7** and the components **9** form at least a part of a controlling circuit (not illustrated). The controlling circuit may include a video signal processing circuit, a tuner, an HDMI signal processor, an AV input terminal, a remote controller signal receiver, a controller, a selector, an on-screen display, a storage (e.g., a ROM, a RAM, an HDD), an audio signal processing circuit, and the like. The controlling circuit controls video outputs (e.g., moving images or still images) from the display surface **4a** of the display device **4**, sound outputs from a speaker (not illustrated), and light emissions from a light emitting diode (LED) (not illustrated). The display device **4**, the speaker, the LED, and the like are examples of an output module.

In the second embodiment, as an example, as illustrated in FIGS. **21** to **23**, the battery **6** and the circuit board **7** do not overlap each other in the thickness direction of the housing **3B** (Z direction), but they are instead laid along an internal surface **3s** (a first surface) of the wall **3m** in the housing. Therefore, the housing **3B** can be configured thinner, compared with a structure in which the battery **6** and the circuit board **7** are overlapped each other in the thickness direction. In the second embodiment as well, the surface (a second surface, not illustrated) of the battery **6** facing the surface **3s** of the wall **3m** and the surface (a second surface, not illustrated) of the circuit board **7** are adhered (attached), at least partially, to the surface **3s** using an adhesive agent, a double-sided adhesive tape, or the like, in the same manner as in the first embodiment. Therefore, in the second embodiment as well, the same advantageous effects of the first embodiment achieved because the electric components such as the battery **6** and the circuit board **7** are adhered to the wall **3m** of the housing **3B** can also be achieved.

Furthermore, as an example, on both sides of the center (the central line CL; see FIGS. **22** and **23**) of the wall **3m**, the surface of the battery **6** and the surface of the circuit board **7** facing surface **3s** are adhered to the wall **3m**. Preferably, relatively wide areas of these surfaces, and more preferably, from an end **6a1** of the surface of the battery **6** and an end **7a1** of the surface of the circuit board **7** facing surface **3s** on the side of the end **3c** to an end **6a2** and an end **7a2** on the side of the end **3e** are adhered to the wall **3m**.

15

Therefore as an example, the wall **3m** can be suppressed from being bent locally. Furthermore, in the second embodiment, as an example, the battery **6** is positioned closer to the end **3c** (a second end), and the circuit board **7** is positioned closer to the end **3e** (a first end). Therefore, as an example, a wider area of the wall **3m** between the end **3c** and the end **3e** can be reinforced. Furthermore, as an example, an area **S1** between the battery **6** and the end **3e** and an area **S2** between the circuit board **7** and the end **3c** may be utilized better for laying other circuit boards (e.g., a driver circuit board **4c** for the display device **4**; see FIG. **21**) or the wiring **15**. Furthermore, in the second embodiment, as an example, the battery **6** and the circuit board **7** are arranged in a manner interspaced from the end **3c** and the end **3e**. Therefore, according to the second embodiment, as an example, the ends **3c** and **3e** where a hand or a finger can easily touch can be prevented from being heated by the heat generated by the battery **6** or the circuit board **7**. Moreover, as may be obvious from FIG. **22**, in the second embodiment, as an example, an area **Ar** to which the electric components are adhered is laid at the central part of the wall **3m** including the central line **CL**, from one side (the side of the end **3d**) to the other side (the side of the end **3f**) of a direction laid along the ends **3c** and **3e**. Therefore, according to the second embodiment, as an example, the stiffness and the strength of the wall **3m** of the second member **3Rr**, and the stiffness and the strength of the housing **3B** in turn, can be improved.

In the second embodiment, as an example, as illustrated in FIG. **22**, a U-shaped cutout **30a** is formed on the end **3c** of the second member **3Rr**. A third member **3Is** made of a low-conductive material (a non-conductive material, an insulating material; e.g., a synthetic resin material) is attached to the cutout **30a**. The third member **3Is** is coupled to the cutout **30a** on the wall **3m** of the second member **3Rr** by heat welding, for example.

In the second embodiment, as an example, as illustrated in FIG. **22**, the antenna module **13** and the camera module **10** are attached to the third member **3Is** made of a low-conductive material. In such a structure, because the conductive material functions as an electromagnetic shield, communications performed via the antenna module **13** can be prevented from being affected. On the side of the rear surface **3b**, a cover (a plate) **10a** is arranged as illustrated in FIG. **20**, and a lens **10b** and a light **10c** of the camera module **10** are exposed through the cover **10a**.

In the second embodiment, as an example, as illustrated in FIG. **22**, the antenna module **13** comprises a communication module **13a** and a grounding module **13b**. A portion of the grounding module **13b** is held between the battery **6** and the wall **3m** of the second member **3Rr**. By electrically connecting the grounding module **13b** to the wall **3m**, the electric potential of the wall **3m** can be brought closer to the ground level (electric potential) of the grounding module **13b** more easily. Therefore, the grounding module **13b** can reduce noise introduced to the antenna module **13**. In addition, the electric potential of the covering of the battery **6** can be brought closer to the ground level (electric potential) of the grounding module **13b** in the antenna module **13** more easily.

In the second embodiment, as an example, as illustrated in FIG. **22**, wiring **15a** (15) electrically connected to the camera module **10** is configured as a flexible printed wiring board, and is laid over the battery **6** in the thickness direction of the housing **3B**. Therefore, according to the second embodiment, as an example, the wiring **15a** functions as an electromagnetic shield and can suppress communications performed via the antenna module **13** from being affected.

16

Furthermore, in the second embodiment, as an example, as illustrated in FIG. **22**, the wiring **15a** is laid along the edge of the battery **6**. Therefore, according to the second embodiment, the wiring **15a** can be laid at a position offset from the center of the battery **6** where temperature could be high, as an example.

In the second embodiment, as an example, as illustrated in FIGS. **22** and **23**, the first connector **16A** is installed on the circuit board **7**. The first connector **16A** is implemented on an edge (end, side) of the circuit board **7**. The first connector **16A** is implemented side by side with other connectors **16** on the circuit board **7**. The first connector **16A** is also arranged along an edge of the cooling mechanism **17** (FIG. **23**). The first connector **16A** is exposed through an opening **3t** provided to the walls **3n**.

The electronic device **1B** according to the second embodiment can also achieve the same advantageous effects as those achieved by having a structure that is similar to that of the television receiver **1A** according to the first embodiment.

An electronic device **1C** according to a third embodiment illustrated in FIG. **24** is configured as a so-called laptop personal computer. The electronic device **1C** comprises a first main body **122** having a flat and rectangular shape and a second main body **123** having a flat and rectangular shape. The first main body **122** and the second main body **123** are connected via a hinge mechanism **124**, in a manner rotatable with respect to each other about a rotation axis **Ax** between an opened configuration illustrated FIG. **24** and a folded configuration not illustrated.

On the first main body **122**, a keyboard **125**, a pointing device **126**, a click button **127**, and the like as input operation modules are arranged in a manner exposed from a front surface **122b** that is an external surface of a housing **122a**. To the second main body **123**, a display **128** as a display device (a component) is provided in a manner exposed from a front surface **123b** that is an external surface of a housing **123a**. The display **128** is configured as an LCD, for example. While the electronic device **1C** is opened, the keyboard **125**, the pointing device **126**, the click button **127**, a display surface **128a** of the display **128**, and the like are exposed so that the user can use. While the electronic device **1C** is folded, the front surface **122b** and the front surface **123b** closely face each other, and the keyboard **125**, the pointing device **126**, the click button **127**, the display **128**, and the like are hidden by the housing **122a** and the housing **123a**. In FIG. **24**, only some of keys **125a** of the keyboard **125** are illustrated.

A circuit board **121** that is similar to the circuit board **7** described in the first embodiment is housed in the housing **122a** of the first main body **122** or the housing **123a** of the second main body **123** (in the third embodiment, only in the housing **122a**). On the circuit board **121**, the first connector **16A** is implemented. The first connector **16A** is exposed through an opening (a second opening) **122e** formed on a side wall **122d** of the housing **122a**.

The display **128** receives a display signal from a controlling circuit comprising a CPU **104** implemented on the circuit board **121**, and displays an image such as a still image or a moving image. The controlling circuit in the electronic device **1C** also comprises storages (e.g., a ROM, a RAM, and an HDD), interface circuits, and various controllers, in addition to the CPU **104**. A speaker (not illustrated) and the like for outputting sound is also internalized in the electronic device **1C**.

The electronic device **1C** according to the third embodiment can also achieve the same advantageous effects as

17

those achieved by having a structure that is similar to that of the television receiver 1A according to the first embodiment.

An electronic device 1D according to a fourth embodiment illustrated in FIG. 25 is configured as a magnetic disk device. The electronic device 1D comprises a housing 131, a magnetic disk reading and writing mechanism 132 housed in the housing 131, and a circuit board 133 mounted on the housing 131 using fasteners such as screws. The magnetic disk reading and writing mechanism 132 comprises a magnetic disk (not illustrated). The first connector 16A is implemented on the circuit board 133, and is exposed through an opening 131b formed on a side wall 131a of the housing 131.

The electronic device 1D according to the embodiment can also achieve the same advantageous effects as those achieved by having a structure that is similar to that of the television receiver 1A according to the first embodiment.

In a fifth embodiment, the first connector 16A is partly different from the first connector 16A according to the embodiments described above. As illustrated in FIG. 26, in the first connector 16A according to the fifth embodiment, depressed portions (recessed portions, stepped portions, recesses) 18p1, 18q1, 18s1, and 18t1 are formed on the sides 18k and 18l of the insertion portions 18b and 18c, instead of the slanted surfaces 18p, 18q, 18s, and 18t. In other words, each of the insertion portions 18b and 18c according to the fifth embodiment comprises the side surfaces 18o and 18r, and portions (depressed portions 18p1, 18q1, 18s1, and 18t1) depressed into the side surfaces 18o and 18r on at least one of the one end 18u of each of the side surfaces 18o and 18r located closer to the base portion 18a and the other end 18v located opposite the one end 18u. The depressed portions 18p1, 18q1, 18s1, and 18t1 are examples of a portion comprising a step portion with respect to a portion (the side surface 18o or 18r) extending along the direction in which the external connector is inserted into or removed (the direction along the arrow C in FIG. 26).

In the fifth embodiment, when the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, the depressed portions 18p1, 18q1, 18s1, and 18t1 permit such a diagonal movement of the external connector 23. Therefore, even if the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, the external connector 23 can be suppressed from pressing the insertion portions 18b and 18c in the direction bending the insertion portions 18b and 18c. Hence, concentration of stress on the insertion portions 18b and 18c can be suppressed, and therefore, the insertion portions 18b and 18c can be suppressed from being damaged.

In a sixth embodiment, the first connector 16A is partly different from the first connector 16A according to the embodiments described above. As illustrated in FIG. 27, the first connector 16A according to the sixth embodiment does not comprise the slanted surfaces 18p, 18q, 18s, and 18t or the depressed portions 18p1, 18q1, 18s1, and 18t1 on the sides 18k and 18l. In other words, the side surfaces 18o and 18r are provided over the entire surfaces of the respective sides 18k and 18l. In the sixth embodiment, the widths of the insertion portions 18b and 18c (the width in the direction along the arrow A in FIG. 27) are smaller than the widths of the respective fitting portions 23a and 23b of the external connector 23 with which the insertion portions 18b and 18c are fitted (connected, coupled, joined). In an arrangement in which the insertion portions 18b and 18c are fitted to the

18

respective fitting portions 16a and 16b, a gap (a space, a play) is provided between the internal surface of each of the insertion portions 18b and 18c and the internal surface of corresponding one of the fitting portions 16a and 16b in the width direction of the insertion portions 18b and 18c (the direction along the arrow A in FIG. 27). In other words, a room is left between the first connector 16A and the external connector that are connected to each other, in the width direction of the first connector 16A (the direction along the arrow A in FIG. 27).

In the sixth embodiment, because a gap (a space, a room) is provided between the internal surface of each of the insertion portions 18b and 18c and the internal surface of corresponding one of the fitting portions 16a and 16b, when the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, such a diagonal movement of the external connector 23 is permitted. Therefore, even if the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, the external connector 23 can be suppressed from pressing the insertion portions 18b and 18c in the direction bending the insertion portions 18b and 18c. Hence, concentration of stress on the insertion portions 18b and 18c can be suppressed, and therefore, the insertion portions 18b and 18c can be suppressed from being damaged.

In a seventh embodiment, the first connector 16A is partly different from the first connector 16A according to the embodiments described above. As illustrated in FIG. 28, in the first connector 16A according to the seventh embodiment, the slanted surfaces 18s and 18t are not provided on the side 18l of the insertion portion 18b, and the side surface 18r is provided over the entire side 18l. Furthermore, the slanted surfaces 18p and 18q are not provided on the side 18k of the insertion portion 18c, and the side surface 18o is provided over the entire side 18k.

In such a configuration as well, when the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, the slanted surfaces 18p, 18q, 18s, and 18t permit the diagonal movement of the external connector 23. Therefore, even if the external connector 23 is removed by being moved diagonally with respect to the direction in which the insertion portions 18b and 18c of the first connector 16A extend, the external connector 23 can be suppressed from pressing the insertion portions 18b and 18c in the direction bending the insertion portions 18b and 18c. Hence, concentration of stress on the insertion portions 18b and 18c can be suppressed, and therefore, the insertion portions 18b and 18c can be suppressed from being damaged.

Instead of the slanted surfaces 18p, 18q, 18s, and 18t, the depressed portions 18p1, 18q1, 18s1, and 18t1 may be provided. As long as at least one of the slanted surfaces 18p, 18q, 18s, and 18t or the depressed portions 18p1, 18q1, 18s1, and 18t1 is provided on the insertion portions 18b and 18c, concentration of stress on the insertion portions 18b and 18c can be suppressed, and therefore, the insertion portions 18b and 18c can be suppressed from being damaged.

A modification of the seventh embodiment will now be explained. As illustrated in FIG. 29, in the first connector 16A according to the modification, the slanted surfaces 18p and 18q are not provided on the side 18k of the insertion portions 18b, and the side surface 18o is provided over the entire side 18k. The slanted surfaces 18s and 18t are not

19

provided on the side **18'** of the insertion portion **18c**, and the side surface **18r** is provided over the entire side **18'**.

In an eighth embodiment, the shape of the opening **3t** on the housing **3A** is different from that in the first embodiment. The eighth embodiment may be applied to the embodiments

other than the first embodiment. The circumference of the opening **3t** according to the eighth embodiment is increased from inside toward outside of the housing **3A**. In other words, the opening **3t** has a sectional area (the sectional area along the arrow **Y** in FIG. **30**) increasing in size in a direction from the inside toward the outside of the housing **3A**. In other words, the size of opening surrounded by a circumferential surface **3u** of the opening **3t** is increased from the inside toward the outside of the housing **3A**.

In such a structure, when the external connector **23** is removed by being moved diagonally with respect to the direction in which the insertion portions **18b** and **18c** of the first connector **16A** extend, the opening **3t** permits the diagonal movement of the external connector **23** more. Hence, concentration of stress on the insertion portions **18b** and **18c** can be suppressed, and therefore, the insertion portions **18b** and **18c** can be suppressed from being damaged. In this structure, it is preferable for the insertion portions **18b** and **18c** to comprise the slanted surfaces **18p**, **18q**, **18s**, and **18t** or the depressed portions **18p1**, **18q1**, **18s1**, and **18t1**; however, the slanted surfaces **18p**, **18q**, **18s**, and **18t** or the depressed portions **18p1**, **18q1**, **18s1**, and **18t1** may not be provided.

In a ninth embodiment, the shape of the external connector **23** is different from those according to the embodiments described above. As illustrated in FIG. **31**, the external connector **23** according to the ninth embodiment, a pair of slanted surfaces **25c** and **25d** are provided, respectively, on a pair of the side surfaces of the recessed portion **25b** made of an insulating member **25**. The slanted surfaces **25c** and **25d** are slanted in a manner increasing the distance between the slanted surfaces **25c** and **25d** from the side of the base portion **29** toward the tip of the insulating member **25**. The slanted surfaces **25c** and **25d** increase the width of the recessed portion **25b** toward the tip of the insulating member **25**. Alternatively, only one of the slanted surfaces **25c** and **25d** may be formed.

In the ninth embodiment, a cutout **24f** is provided on a side **24d** of the shell **24**, and a cutout **24g** is provided on a portion of the side **24d** of the protrusion **24e**. Alternatively, only one of the cutouts **24f** and **24g** may be provided.

In such a structure as well, when the external connector **23** is removed by being moved diagonally with respect to the direction in which the insertion portions **18b** and **18c** of the first connector **16A** extend, the slanted surfaces **25c** and **25d** and the cutouts **24f** and **24g** permit such a diagonal movement of the external connector **23**. Therefore, even if the external connector **23** is removed by being moved diagonally with respect to the direction in which the insertion portions **18b** and **18c** of the first connector **16A** extend, the external connector **23** can be suppressed from pressing the insertion portions **18b** and **18c** in the direction bending the insertion portions **18b** and **18c**. Hence, concentration of stress on the insertion portions **18b** and **18c** can be suppressed, and therefore, the insertion portions **18b** and **18c** can be suppressed from being damaged.

A cutout may be provided at least one of the pair of side surfaces (sides) of the recessed portion **25b**. A cutout may be provided on a side **24c** of the shell **24** or a portion of the protrusion **24e** on the side of the side **24c**. Furthermore, at least one of the side **24d** of the shell **24** and a portion of the

20

protrusion **24e** on the side of the side **24c** may be slanted with respect to each other so that the distance between the side **24d** of the shell **24** and the portion of the protrusion **24e** on the side of the side **24c** is increased from the base portion **29** toward the tip. In other words, by slanting the sides (walls) of the fitting portions **23a** and **23b** or providing cutouts to the fitting portions **23a** and **23b**, the diagonal movement of the external connector **23** can be permitted.

As explained above, according to each of the embodiments described above, the first connector **16A** can be suppressed from being damaged.

Moreover, the various modules of the systems described herein can be implemented as software applications, hardware and/or software modules, or components on one or more computers, such as servers. While the various modules are illustrated separately, they may share some or all of the same underlying logic or code.

While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions. For example, a connector is not limited to one comprising two insertion portions, but may also comprise only one insertion portion.

What is claimed is:

1. A television receiver comprising:

a housing comprising a first opening and a second opening;

a display comprising a rear surface and a display surface exposed through the first opening, the display being in the housing;

a circuit board on the rear surface side of the display, and in the housing; and

a connector in the housing, exposed through the second opening, configured to be coupled to the circuit board, and configured to be connected with an external connector, wherein

the connector comprises:

an insulating member comprising: a base portion; and an insertion portion extending from the base portion toward the second opening and configured to be inserted into a connection portion of the external connector;

a plurality of terminal members configured to be provided to the insertion portion, and to be coupled to the connection portion; and

a container configured to house the insertion portion, and comprises one end at which the external connector is inserted, wherein

the insertion portion comprises: a side surface; and a slanted surface provided to at least one of ends of the side surface at the base portion side and the other one of the ends of the side surface, the slanted surface being slanted with respect to the side surface to reduce the width of the insertion portion more as the slanted surface extends further away from the side surface.

2. The television receiver of claim 1, wherein the slanted surface is configured to be provided to both of the ends of the side surface.

3. The television receiver of claim 2, wherein the slanted surface provided to the other one of the ends is configured

21

to be shorter in a length along a direction of the insertion portion than the slanted surface provided to the one of the ends.

4. The television receiver of claim 1, wherein the slanted surface comprises a flat surface.

5. The television receiver of claim 1, wherein the slanted surface comprises a curved surface.

6. The television receiver of claim 1, wherein the insulating member comprises two insertion portions, and the slanted surface is provided to each of the insertion portions.

7. The television receiver of claim 1, wherein the second opening is configured to be formed on a side wall of the housing, the connector is configured to be provided to an end of the circuit board, and

a part including the one end of the container of the connector is configured to project out from the circuit board.

8. The television receiver of claim 1, wherein the one end of the container is in the second opening.

9. The television receiver of claim 1, wherein a part of the insertion portion is in the second opening.

10. A television receiver comprising:

a housing;

a circuit board in the housing; and

a connector in the housing, configured to be coupled to the circuit board, and configured to be connected with an external connector, wherein

the connector comprises:

an insulating member comprising: a base portion; and an insertion portion extending from the base portion and configured to be inserted into a connection portion of the external connector; and

a plurality of terminal members configured to be provided to the insertion portion, and to be coupled to the connection portion, wherein

the insertion portion comprises: a side surface; and a depressed portion provided to at least one of ends of the side surface at the base portion and the other one of the

22

ends of the side surface, the depressed portion being depressed with respect to the side surface, the depressed portion is configured to be provided to both of the ends of the side surface, and

the depressed portion provided to the other one of the ends is configured to be shorter in a length along a direction of the insertion portion than the depressed portion provided to the one of the ends.

11. The television receiver of claim 10, wherein the depressed portion comprises a flat surface.

12. The television receiver of claim 10, wherein the depressed portion comprises a curved surface.

13. The television receiver of claim 10, wherein the insulating member comprises two insertion portions, and the depressed portion is provided to each of the insertion portions.

14. An electronic device comprising:

a housing;

a circuit board in the housing; and

a connector in the housing, and configured to be coupled to the circuit board, wherein

the connector comprises: a base portion; and a surface portion extending from the base portion along a direction and brought into contact with an external connector when the connector is connected with the external connector, the direction being a direction in which the external connector is inserted and removed, and wherein

the surface portion comprises: a first portion along the direction; and a second portion comprising a step portion with respect to the first portion,

the second portion is configured to be provided to both one of ends of the first portion at the base portion side and the other one of the ends of the first portion, and the second portion provided the other one of the ends is configured to be shorter in a length along a direction of the surface portion than the second portion provided to the one of the ends.

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